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BIOLOGY.—*Biological reconnaissance along the Ahlasuruk River east of Howard Pass, Brooks Range, Alaska, with notes on the avifauna.* LAURENCE IRVING and SIMON PANEAK,[1] Arctic Health Research Center, Anchorage, Alaska. (Communicated by Herbert Friedmann.)

Through Howard Pass in the Brooks Range of Alaska there was once an important Eskimo trade route. Here the Nunamiut Eskimos of the mountains of Arctic Alaska met the people from the upper Kobuk and Noatak Rivers to trade for articles obtained from the people of the western Arctic coast. Usually before the snow melted in spring, parties of Nunamiut families traveled north through the pass along the Etivluk to the Colville River. Here the majority of the parties assembled their skin boats and proceeded eastward to the Colville mouth. Some parties diverged northward to meet the people of the coast near Barrow. The eastbound travelers often went far along the Arctic Alaskan and Canadian coast.

As a young man Paneak traveled these routes, although his usual mountain residence was east of Howard Pass. From his parents he learned about the old traffic which had brought arms, powder, lead, utensils, tools, tea, and tobacco from Russian traders on the coast. Even the spotted and white skins of Siberian reindeer were handled on this overland route across Alaska, and instances were known in which such skins eventually reached Eskimos east of Aklavik.

Among these people commerce dealt in many articles valued for decorative purposes, and each meeting between Eskimo groups was marked by games, contests, and the intense sociability which associated the scattered Eskimo families and villages in a common pattern of social culture. Their existence, which was at a level far above mere subsistence, required the exercise of great skill in their well-organized hunting. Their travel followed routes along which ancestral knowledge assured them that animals and fuel would be abundant in that season. It was not the policy of Eskimo living to hunt and pursue laboriously but to intercept their needs in the places and at the times when natural products were abundant and suitable for use. In short, they lived by the accurate prediction of natural events based upon cultivated knowledge of natural history. This was made effective by social action and refreshed by constant exchange of information (L. Irving, 1953).

An ancient trade route of hunting people is likely to follow the abundance of the animals upon which they depend. So we had discussed Howard Pass as a locality well situated for biological observation. It traverses the Brooks Range in its west-central part. It leads from near the headwaters of the Alatna River, flowing southeast, and the Kobuk and Noatak Rivers running west over a low watershed to the

[1] We wish to express our thanks to Harry Brown, of Kobuk, for his genial hospitality and for his understanding comments on the people and country. Charles Sheldon, chief of the Kobuk Village Council, gave us pertinent information about birds and geography, which was also extended by numerous others of the sociable Kobukmiut. John Cross, of Wien Airlines, Inc., scheduled and accurately accomplished our flight to and from lake "Itivlik." Dr. Herbert Friedmann verified the identification of specimens and extended the facilities of the division of birds in the U. S. National Museum for the preparation of this report. A grant from the Explorer's Club assisted us to meet costs of transportation.

Place names in quotation marks have been used by Nunamiut and Kobukmiut for many years. Except for an evident relation of some of them to those on Stoney's sketch map, these names do not appear to have been published.

northward flowing Etivluk and so to the upper Colville Valley. The country of the Kobuk, lower Alatna, and lower Noatak is wooded. The mountains and Arctic slope are treeless but with low willows in parts of the valleys. The pass was, accordingly, a route from the northwestern Alaskan forest to the open tundra of the rolling Arctic slope. As it has been a residence for ancient man and a thoroughfare for his travel, it is also a significant channel in the distribution of animals.

We knew the country well around Anaktuvuk Pass, which traverses the center of the Brooks Range. Howard Pass is about 140 miles west of Anaktuvuk and lies about halfway from there to the western Arctic coast. No biologist had recorded observations between Anaktuvuk and the western coast. The region appeared to be strategically located in an area biologically unknown. Because of birds' conspicuous activity and since we had well-organized information about the birds of Anaktuvuk, it appeared likely that we could assess the nesting avifauna during one season. Such observations and comments as we could make upon the people who formerly occupied the region are presented for the assistance of further anthropological investigation.

The mountains of the Brooks Range separate the generally forested interior from the tundra of the Arctic slope along a bend extending from the longitude of Demarcation Point nearly to the western Arctic coast. The midwestern part of the mountains is traversed by a pass at about 2,000 feet elevation. This pass is called Howard Pass after the young naval officer who was the first white man to use it in 1886. He was detached from Lieutenant Stoney's party to travel with the Nunamiut Eskimos on their annual trip from the mountains to the Colville River and Point Barrow (Stoney, 1900).

Howard set out with a leisurely traveling group of Eskimo families, which sometimes numbered 100 persons. Occasional congregations described along the route indicate that perhaps several thousand inland Eskimos were then traveling to the northern and eastern Arctic coast after their winter residence in the mountains. At that time Paneak's parents lived in the mountains to the east, where they were, for the time, accustomed to remain during summer. They had described to him Stoney's visit in 1885 to Chandler Lake and the conditions of those times. The mountain country was then populated by the Nunamiut Eskimos, among whom Paneak is one of the 75 people now living at Anaktuvuk Pass, the only present residents of the Brooks Range. The valleys channeled the wanderings of the caribou and ordered the hunting life of the Nunamiut people (W. Irving, 1953).

A few well-marked passes are significant as routes for birds migrating northward, and many are known by the Nunamiut to nest in the valleys. The lines of bird migration coincide in part with the travels of recent inland Eskimos and of more ancient people who have left evidence of their dwelling in the country. Man, mammals, and birds were distributed through these regions in patterns that are variously related to the terrain. The distribution of birds is easiest to determine.

In the winter of 1943 Paneak had been in Howard Pass with his family, but severe weather restricted his observation. In 1952 Irving spent two days there with President Terris Moore of the University of Alaska at the end of May, making a few observations upon the migration which was in progress. On June 19, 1953, we were landed upon a lake about 2 miles in diameter situated about 20 miles east of the designation of Howard Pass. The lake, called "Itivlik" by the Nunamiut and Kobuk Eskimos, is at latitude 68°8′N., longitude 156°10′W. About its shores we counted 100 sites of ancient dwellings near which numerous artifacts attested a variety of cultural methods among the old residents. The lake was apparently an ancient center, and the present abundance of caribou and fish suggests good reasons for its occupation.

The lake drains northward to a small river 1½ miles away called the Nigu on some maps. This name is unknown to the Eskimos, who call it the "Ahlasuruk." This is a good name, for in Eskimo it means small "Ahlasook" (now named Alatna). It refers to the northwesterly course of the "Ahla-

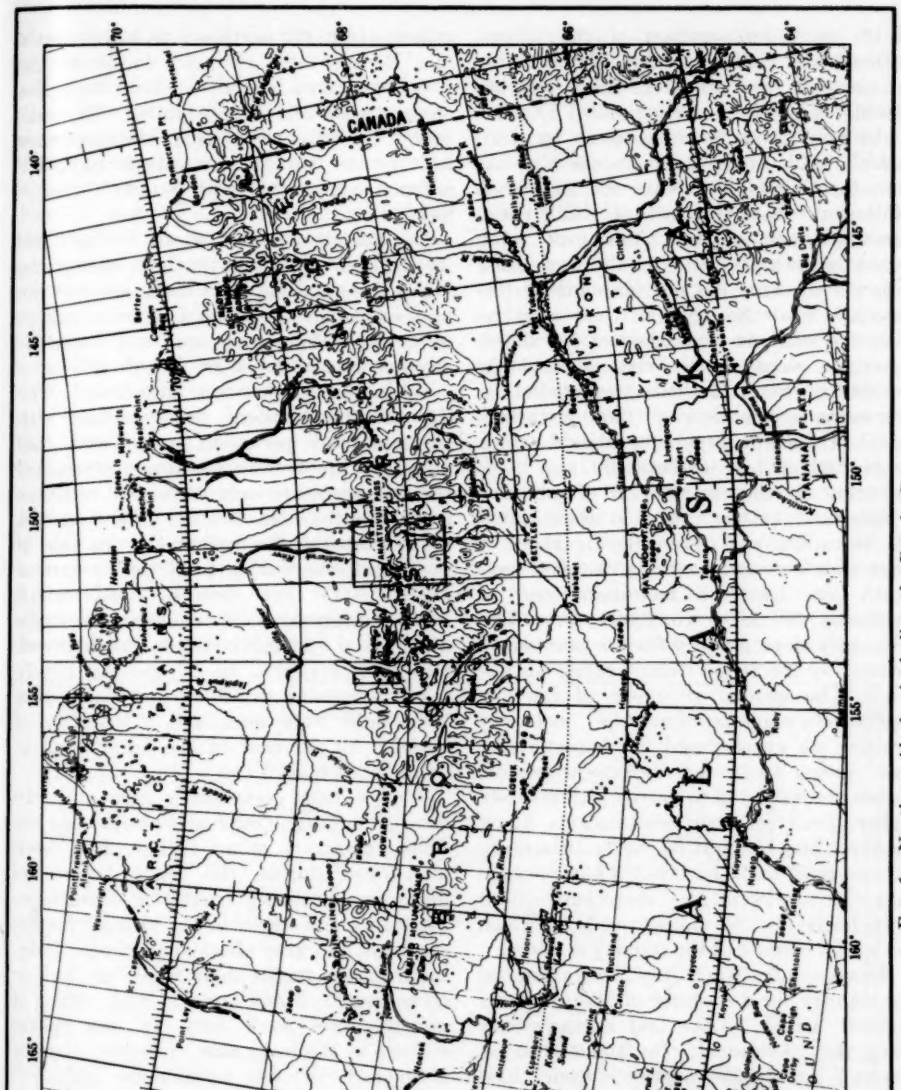

FIG. 1.—Northern Alaska, including the Brooks Range.

suruk" as a prolongation of the longer southeasterly course of the Alatna. The "Ahlasuruk" rises about 32 miles east of "Itivlik" and joins the river called Etivluk on the map about 30 miles north by west from the lake. From this point the Etivluk flows to the Colville. Near the source of "Ahlasuruk" the west fork of Killik rises. Somewhat west of the "Ahlasuruk" and Alatna headwaters the Noatak River rises to flow westward, and not far south of the Noatak's head the Kobuk River rises to drain the southern watershed of the Baird Mountains along a westward course. It is the nearby origin of these great radiating river systems which Stoney (1900) remarked to make the region a center of inland Eskimo life and which has undoubtedly also been important in the distribution of animals.

Near the lake the river is at about 2,000 feet elevation, and the valley is about 5 miles wide between contours of 3,000 feet. North and eastward mountains rise to elevations of 5,000 to 6,000 feet. The irregularly sloping valley floor is extensively covered by the sedge clumps called niggerheads. The general greenness of the low vegetation suggests that the cool wet weather we encountered is characteristic. Over great areas the infrequent willow bushes are restricted to narrow bands rarely higher than 3 feet along small streams. Along the river and some of its larger tributaries willows grow to 15 feet, but many of them bear the marks of the deep hard-winter drifts formed by the violent winds for which the winter climate of the country is noted.

Between June 19 and July 22 we examined the country for a distance of about 3 miles around "Itivlik" Lake and northwesterly along the "Ahlasuruk" for about 8 miles. About 7 linear miles upstream from "Itivlik" are the forks where "Itkilyiargiak" branches eastward. This name means "go to visit the Indians" and may refer to some period in Eskimo history when Indians invaded the tundra.

Along the winding course of the river it had been necessary to haul our small boat by line in the swift shallow gravelly stream. From our camp at this fork we walked up "Itkilyiargiak" and "Ahlasuruk," traveling about 5 miles up the latter to a stream entering from the northeast on a high gravel fan. Because this elevated course of the stream permits a long view in both directions along "Ahlasuruk," it is called "Inyuraktoat." The hills at the base of the mountains between the two forks are called "Issygok," a name comparable with Stoney's "Isseyhuk."

Our search extended about to the 3,000 feet contour along the northern side of the valley, penetrating short distances into the northern mountains along the narrow valleys of several tributary streams, and occasionally reaching about 4,000 feet elevations.

While the weather was unpleasantly like that of the northern Arctic coast, with frequent and persistent rains and cold overcast, the low temperatures restrained the mosquitoes to only occasional nuisance levels. In the cold weather many caribou moved through the valley. On one day of prolonged observation from the mountains about 10,000 were seen in bands which could be approximately counted. No single direction or systematic course was observed, and they appeared to be moving locally from mountains to valley and back. Few large bulls were seen, and a majority of perhaps 80 per cent of the adult cows in some bands had calves.

Wolves were occasionally seen and two dens were found. One had six pups, and the other, about 8 miles distant, had been abandoned during the night before its discovery, probably from the disturbance caused by our search in the vicinity for fox sparrows and gray-cheeked thrushes. Judging from the tracks there were only two or three pups. Many tracks and signs of grizzly bears were seen. In the sparse willows at the forks near "Issygok" a great abundance of the leguminous "Mashu" promised extensive feeding for bears when the roots should mature. Two wolverines and several sets of their tracks were seen. Ground squirrels were common but restricted by the wet grassy ground to areas of limited extent. The region appears to be productive of large animals. The caribou are known to be commonly abundant throughout the winter and have afforded the sustenance of the few recent Eskimo hunters as well as the once numerous ancient

travelers and residents in that part of the mountains.

Forty-six kinds of birds were listed between June 19 and July 22. All are regarded as nesting birds except the single specimen of Baird's sandpiper. After six years study at Anaktuvuk, 60 birds are listed as nesting there (Irving, 1954). Six kinds missed at "Ahlasuruk" are so well known and conspicuous at Anaktuvuk that our failure to find them is significant. These are: *Totanus flavipes*, *Erolia bairdii*, *Erolia minutilla*, *Ereunetes pusillus*, *Leucosticte tephrocotis tephrocotis*, and *Calcarius pictus*.

All these birds but *Leucosticte* would have been seen in one day's observation at Anaktuvuk even without special familiarity with the region. *Leucosticte* would probably have been seen in three or four hours search of its mountain side habitat at Anaktuvuk. At "Ahlasuruk" we devoted much more time to an unrewarded search in areas which appeared suitable.

The discovery of a red-spotted bluethroat (*Luscinia svecica*) near "Itivlik" lake is not considered to signify a distinction of the avifauna of the region, for it is a bird seldom reported from only a few localities of Alaska. The abundance of snipe (*Capella gallinago delicata*) and numerous dowitchers (*Limnodromus scolopaceus*) along "Ahlasuruk" is in contrast with the uncommonness of the former and the absence of the latter in nesting season at Anaktuvuk. Difference in numbers observed is not so important a distinction between the two avifaunas as is the difference between common occurrence and no observation in an intensive search.

References to the occurrence of *Totanus*, *Leucosticte*, and *Calcarius pictus* in western arctic Alaska are lacking (Bailey, 1948; Ridgway, 1901, and 1919). The other three kinds have been reported on the wooded Kobuk about 100 miles south of our position (Grinnell, 1900), and *E. bairdii* and *E. pusillus* have been reported on the western Arctic coast of Alaska (Bailey, 1948).

It may be that the results of the survey of the birds in some 300 square miles about the

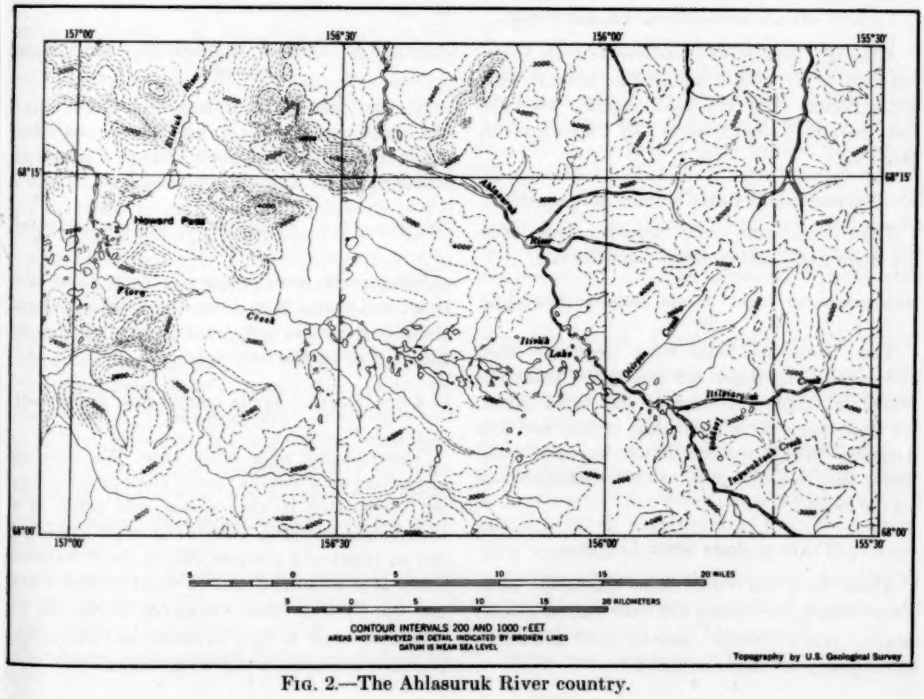

FIG. 2.—The Ahlasuruk River country.

"Ahlasuruk" represent only a local pattern of distribution. On the other hand, it is probable that the absence of these six kinds indicates a step in the diminution of the northwestern migration of birds through America. Only 100 miles of arctic Alaska extend west of "Ahlasuruk." Although some birds migrate from Alaska into Siberia the strong westward current of American bird migration is close to its terminus at Howard Pass. The number of continental American bird species seems to decline in the western part of the Brooks Range.

COMMON LOON: **Gavia immer** (Brünnich)

Of many loons seen two were identified as black-billed, which are generally more frequently seen within the mountains than yellow-billed loons. Both are restricted to lakes large enough to provide room for their laborious take-off from the water, and they are considered by the Nunamiut to resort only to waters producing fish large enough for human food. There are very few lakes in the mountains suitable by these criteria for large loons.

YELLOW-BILLED LOON: **Gavia adamsi** (Gray)

Although considered less frequent than the common loons in the mountains, several were distinguished. The yellowbill catches the light and permits identification by telescope at long range.

PACIFIC LOON: **Gavia arctica** (Linnaeus)

These loons were more frequently seen than the larger loons, and on lakes of smaller size.

RED-THROATED LOON: **Gavia stellata** (Pontoppidan)

These were the loons most frequently seen and heard. The flight call that gives them the Nunamiut name "Kakerauk" was often heard, for these loons fly a great deal in mid and late summer. Since they are suited by very small lakes, they are the most widely distributed of all the loons.

PINTAIL: **Anas acuta** Linnaeus

These were the ducks most commonly seen. They were mainly along the river and in smaller nearby ponds. Single females and numerous small groups of males occurred.

GREEN-WINGED TEAL: **Anas carolinensis** Gmelin

These teals were frequently seen along the river. Most of those observed were males which were often in groups of three or four.

SCAUP DUCKS: **Aythya** sp.

Single female and male scaup ducks were nearly as common as pintails but were mainly present in lakes. Several families of young were seen, and after mid-July males were more often in groups of three or four and on the larger lakes. They are very shy, and in the prevalent overcast no certain distinction could be made between the greater and lesser forms.

OLD SQUAW: **Clangula hyemalis** (Linnaeus)

In some of the small and larger marshy bordered ponds the alighting of a single male often attracted a female from her concealment to swim about with him in apparent domestic association. This was in midsummer when the males of many kinds of ducks keep company only with their own sex. In mid-July a family of young was seen, and subsequently two or three males were occasionally seen together as if the family ties were relaxed.

HARLEQUIN DUCK: **Histrionicus histrionicus** (Linnaeus)

A male was distinguished as it rose from the swift shallow river. A female collected on the rocky border of swift "Otirgon" Creek is identified as *H. h. pacificus* Brooks.

RED-BREASTED MERGANSER: **Mergus serrator** Linnaeus

Mergansers were frequently seen along the river, and males were more often distinguished. Occasionally three or four males were together on the river or on the large lakes.

GOLDEN EAGLE: **Aquila chrysaetos canadensis** (Linnaeus)

These eagles were often seen. We watched one sitting on a distant tundra slope as a hunting red fox scented it, approached, and acted as if snatching something away. The eagle appeared not to resist and jumped only a short distance away as if so gorged that it could neither resist nor fly. It is a likely character of the fox to recognize such a rare occasion as will safely permit it to snatch food from an eagle.

GYRFALCON: **Falco rusticolus** Linnaeus

In addition to several other observations of gyrfalcons a pair was seen about a nest on a steep cliff. Fresh droppings and old weathered signs indicated that the site was regularly occupied, but no young birds could be distinguished.

WILLOW PTARMIGAN: **Lagopus lagopus** (Linnaeus)

Although females with chicks were less frequently seen than was the case with rock ptarmigan, nesting and summer resident willow ptarmigan appeared more numerous than had been seen in other summers at Anaktuvuk. Unusually large numbers of ptarmigan migrated through Anaktuvuk in the late winter of 1952 and more in 1953. It appears as if they are also abundant in summer in the low parts of the "Ahlasuruk" valley. As the season progressed males were more frequently associated and groups of six were among the willows of the gravelly stream beds commonly in mid-July. Specimens were identified as *L. l. alascensis* Swarth. Two males weighed 523 and 572 grams.

ROCK PTARMIGAN: **Lagopus mutus** (Montin)

These ptarmigan were common among the sedge hummocks on the high ground of the valley. On June 25 the chicks of a brood were just able to run for a short distance but one was easily caught. Thereafter the young became too swift to catch, and on July 7 some young birds flew well down the slopes while others ran. The usual brood included three to seven chicks with no reduction in numbers visible through to the time of flight, but we saw one brood of 11 running chicks. Fourteen eggs are sometimes found in the nest. Until this time the males were often with the females and sometimes shared with them in assuming the posture of trailing wings when we approached the young. Both rock ptarmigan parents show more active concern for their young than do willow ptarmigan. In mid-July, however, the male rock ptarmigan were single in the gravel stream beds or hill sides. Although the females became completely brown colored when nesting the males retained their white under plumage.

Specimens of adults were identified as: *L. m. nelsoni* Stejneger. Two males weighed 503 and 460 grams. One female weighed 427 grams. One downy male weighed 13.3 grams on June 25.

SEMIPALMATED PLOVER: **Charadrius hiaticula** Linnaeus

These plovers were common on the bars of finer-grained gravel along the river and on some broad gravel stretches along tributary streams. Several birds were usually seen in one area, and they were frequently as demonstrative as when the young are near.

AMERICAN GOLDEN PLOVER: **Pluvialis dominica** (P. L. S. Müller)

On the somewhat elevated areas of ground which were usually dry and sparsely vegetated because of their moraine gravel composition a pair of plovers was commonly a feature of the view. They seemed to spend much of their time in statuesque poses alertly surveying the country and ready to call as we came near. Early in the season close approach to a nesting area evoked the posturing of a parent bird which is supposed to distract interest from the nest. This behavior reveals its proximity and simplifies discovery. By July 2 the pinfeathers denoting moult were conspicuous, but the adult pairs remained associated until July 22 when we left the region. In early August the adults become scarce about Anaktuvuk while the young are still incompletely grown.

On May 26, 1952, two females collected in Howard Pass weighed 143 and 149 grams and contained eggs 9 and 10 mm long. At this season migrants were seen in groups as large as 20, but some birds appeared to have located for nesting. Three males collected on June 22 and July 1, 1953, weighed 137, 157, and 157 grams and had testes 9 mm on the first date and small on the second. Careful scrutiny of many birds in the field revealed only the common characteristics of *dominica*.

WILSON'S SNIPE: **Capella gallinago** (Linnaeus)

Snipe were commonly winnowing over marshy areas and occasionally their acrobatic evolutions could be seen. Their predilection for sounding in overcast and drizzling weather makes it difficult to discern their high erratic flight with its sudden descents. The association of their sound with foul weather brings them the designation "weather makers" among the Nunamiut, and their influence in this direction was notably borne out by the commonness of their sound and bad weather along the "Ahlasuruk."

Snipe are regularly heard but rarely seen

in summer at Anaktuvuk, although in 1953 they were heard more frequently than in the five previous years of recorded observation there. The numbers on the "Ahlasuruk" were much greater, as might agree with the more extensive marshy ground. We have not recorded any observation of a snipe seen except in its noisy flight, but nesting is indicated by those which are heard persistently.

WANDERING TATLER: **Heteroscelus incanus** (Gmelin)

On July 1 a pair of tatlers noisily fussed about us in the gravelly bed of a small stream in its narrow valley among the mountains. Search did not reveal the young suspected of being near. In six years we have only once found downy young tatlers and have no nest to record. The Nunamiut have earlier found eggs on gravel bars, usually on the swift small streams among the mountains. Tatlers were seen at several other similar locations. From one gravel bar a pair took off to follow and apparently harry a short-eared owl out of their domain.

A male and a female specimen weighed 102 and 107 grams.

PECTORAL SANDPIPER: **Erolia melanotos** Vieillot

These sandpipers were frequently seen in flight. At the first part of our visit they were seen singly, later in twos and threes and after mid July in a group of 10. Although their nests have been often seen along the arctic coast we have not recorded any in six years at Anaktuvuk. Along the "Ahlasuruk" the birds were more frequently seen but their nests remained hidden from us.

On May 25 and 26, 1952, in Howard Pass numbers of pectoral sandpipers were seen in migrant flocks of 30 or more and occasionally in groups of two or three. A male specimen collected then weighed 90 grams, and a female collected July 1, 1953, at "Ahlasuruk" weighed 52 grams.

BAIRD'S SANDPIPER: **Erolia bairdii** (Coues)

Only once was this bird seen as it fed desultorily on a mud bar by the river. This is in contrast with their common and widespread distribution as breeding birds in Anaktuvuk. This specimen was a male with testes 3 mm, molted and weighing 34 grams.

DOWITCHER: **Limnodromus scolopaceus** (Say)

About six dowitchers were seen. Most were in flight but two flew about over marshy-bordered ponds, frequently alighting. In six years at Anaktuvuk we have no recorded observation of a summer dowitcher although the Nunamiut think that they sometimes nest in the mountains during summer. They are common migrants for a brief spring period at Anaktuvuk. On May 25, 1952, a few migrants were seen along the Noatak River about 15 miles south of Howard Pass. A male was collected there and two were collected on the "Ahlasuruk," the latter weighing 90 and 100 grams.

NORTHERN PHALAROPE: **Lobipes lobatus** (Linnaeus)

These phalaropes were frequently seen around the grassy bordered ponds and pools. Often one or two would be floating quietly with head erect and alert or feeding. More often later in the season many might be darting about like swallows over a small lake but occasionally settling on the water. Their restless flight activity increased rapidly as the season progressed and by mid July it was often intense. They then frequently associated briefly in flocks of a dozen. At this time it is doubtful if the young were flying freely, for in Anaktuvuk nests with only slightly incubated eggs were found on June 22.

PARASITIC JAEGER: **Stercorarius parasiticus** (Linnaeus)

These jaegers were numerous and hunted diligently, often in pairs. On only one occasion was a dark-phased bird seen. It was in company with a light bird and landed frequently about a marshy area as if it were a nesting site. Two dove repeatedly at the place where a rock ptarmigan with her brood had just passed over a knoll, but the jaegers did not quite reach ground and caught nothing. We could not see how the mother operated her system of defense on this bare ground against these vigorous predators.

LONG-TAILED JAEGERS: **Stercorarius longicaudus** Vieillot

On June 20 six of these jaegers were standing on the ice of "Itivilik" Lake just before it went out. All were light-phase birds, as were all the many others seen. They were several times more numerous than parasitic jaegers and readily came to swoop persistently close to our heads when we invaded their territory.

GLAUCOUS GULL: **Larus hyperboreus** Gunnerus

These gulls were more numerous than in summer at Anaktuvuk. The central points for a pair seemed to be 2 or 3 miles apart along the

river. Usually wary, at two places one persistently hovered calling close above us.

SHORT-BILLED GULL: **Larus canus brachyrhynchus** Richardson

These gulls were more numerous and less wary than glaucous gulls, frequently diverting their line of flight to pass over and examine us. Their calls are soft and pleasant. Altogether they are friendly birds for gulls.

ARCTIC TERN: **Sterna pardisaea** Pontoppidan

Terns were frequently seen flying or fishing along the river and at some of the lakes. Usually two or a few operated together and on July 2 about 12 persistently fished one small lake. As they departed in the evening 10 were observed together flying down the river. We did not see their nesting place but from the course of their flights believe that their nests were located down river, where the gravel bars are more extensive.

SHORT-EARED OWL: **Asio flammeus flammeus** (Pontoppidan)

Occasionally an owl was seen erratically flying over the tundra often descending to just above the sedge tips. Here as elsewhere they are often pursued by small birds.

PALLID HORNED LARK: **Eremophila alpestris** (Linnaeus)

Larks were seen on many higher and dry areas. By July 2 young birds were flying and their trend with the old birds was SE along the base of the mountains. Early arrivals, they are one of the earliest to depart. A male and a female specimen are identified as *E. a. arcticola* (Oberholser).

RAVEN: **Corvus corax** Linnaeus

A few ravens were seen but usually singly and not so often as might be expected when caribou were so numerous that the remains of those that perished afforded good feed for ravens. Ravens seem to gather about mountains with high steep cliffs, which are uncommon near "Ahlasuruk."

EASTERN ROBIN: **Turdus migratorius** Linnaeus

Robins were seen on the Noatak River and in Howard Pass on May 25 and 26, 1952. Along the "Ahlasuruk" they were frequently seen late in June, and after July 1 nests of this year were found empty in many patches of willows. On July 11 a young male was collected flying well and weighing 70 grams, which is within 10 grams of the average adult weight in summer. During this season the young birds were with their noisily solicitous parents. On July 12 a bird was flushed from a nest containing three clean surfaced and apparently fresh eggs. With the rapid development of young robins these could hatch and reach the size of the young male which was collected in about five weeks, and become strong flying birds by the end of August. Robins are still common at Anaktuvuk early in September and appear to leave the mountains in numbers in the second week. There was thus a good prospect for this late brood to be ready to migrate. A young male was identified as *T. m. migratorius* (Linnaeus).

GRAY-CHEEKED THRUSH: **Hylocichla minima** (Lafresnaye)

These thrushes were frequently seen and heard among the thick willows. At this season they were so shy and secretive that none could be obtained for identification.

WHEATEAR: **Oenanthe oenanthe** (Linnaeus)

Wheatears were frequently seen along the base of the mountains and upward over the lower rock slides. On July 8 young birds were flying and one collected had adult weight but not full length of tail. After the young wheatears fly the restless shy behavior of the adults changes to calm and after mid July the birds come down to lower ground where they show little apprehensiveness. Their deportment on the "Ahlasuruk" agreed with that observed in Anaktuvuk. An adult male weighing 25 grams and the young male weighing 25 grams on July 8 are identified as *O. o. oenanthe* (Linnaeus).

RED-SPOTTED BLUETHROAT: **Luscinia svecica** (Linnaeus)

A small bird with dark grayish back and fox-colored rump and outer tail feathers flew from some thick low willows near "Itivlik" to a nearby sedge clump and moved swiftly about in wren like posture. When it returned a second time it was collected; it weighed 20 grams and was identified as a female *L. s. awatcha* (Gmelin). The eggs measured 2 mm, and the bare breast indicated its brooding condition. We had not recorded the bluethroat from Anaktuvuk, nor was it known among the Nunamiut. Its appearance is so distinctive that it would have been remarked upon if observed. It is difficult to

distinguish retiring birds in cover, but the close observation of the country and the unusualness of the bird's appearance make us believe that bluethroats are as rare in the interior as the few authenticated reports indicate.

WILLOW WARBLER: **Phylloscopus borealis** (Blasius)

Among the low willows along a small stream and within 200 yards of "Itivlik" Lake five pairs of willow warblers were located by the singing of the male and the occasional appearance nearby of the female. Along the "Ahlasuruk" about a dozen pairs were located by song and appearance among willows. When wind moves the willow leaves these small warblers are not easy to see, for although not shy they move swiftly. They appeared to be as common as in similar situations in Anaktuvuk. The historic Nunamiut familiarity with these birds is shown by the fact that they have an explicit name (L. Irving, 1953). A female with bare breast and weighing 10 grams was identified as *P. b. kennicotti* (Baird).

YELLOW WAGTAIL: **Motacilla flava** Linnaeus

Wagtails were as conspicuous and common on the "Ahlasuruk" as at Anaktuvuk. They remained active throughout our stay, whereas many birds became very secretive in July. One male specimen was identified as *M. f. tschutschensis* (Gmelin).

WATER PIPIT: **Anthus spinoletta** (Linnaeus)

Pipits were common on the grassy bases of the mountains and higher on the rock slides. On July 2 some young birds were just flying, and on July 7 many pipits were seen rather closely associated in contrast to their earlier appearance as individuals. Two female specimens each weighed 19 grams and were identified as *A. s. rubescens* (Tunstall). On July 1 the breasts of the two females were in bare brooding condition.

GREAT SHRIKE: **Lanius excubitor** Linnaeus

Shrikes were frequently seen among the willows. Only once at "Ahlasuruk" was their pursuit observed. The trial was brief for the redpoll easily escaped from a pair of shrikes by its ability to ascend rapidly. Several times redpolls and tree sparrows appeared undisturbed by the near proximity of shrikes. The Nunamiut say that shrikes act inoffensively until, its suspicions lulled, a victim can be suddenly and easily captured. The usual appearance of these arctic shrikes is in conformity with the story, for we have seen a number of unsuccessful pursuits which have given no high opinion of the shrikes' flying ability for overt attack.

PILEOLATED WARBLER: **Wilsonia pusilla** (Wilson)

While we were watching through the night for wolf pups to emerge from a den, at 3 a.m. a pileolated warbler took position on a willow nearby, sang twice and flew down to the low brush. We continued to watch in this region until an adult wolf returned to the den at 8 a.m., and we searched while camped in the vicinity for four days without seeing the warbler again. The brief view at this season was characteristic of a nesting bird. In Anaktuvuk we have taken one specimen and have no other sight identification. The specimen bird had been singing at the same place on two days. We have many times briefly seen and had reports of yellow warblers which were not distinguishable from willow warblers except that the birds appeared too yellow. We suspect that *Wilsonia* nests at Anaktuvuk. In the same terms we may suspect that one clear view of it at "Ahlasuruk" supports the view that it nests there.

HOARY REDPOLL: **Acanthis hornemanni** (Holboell)

Redpolls of the two forms are the third most numerous kinds of bird seen on the "Ahlasuruk." We have yet to establish a distinction in habitat or behavior of the two redpolls which are so common in arctic Alaska. Part of the uncertainty rests upon the difficulty of sure identification in the field, although we regularly come out with a distinction of two forms by comparing the specimens. Our field reports at "Ahlasuruk" as at Anaktuvuk indicate a preponderance of hoary redpolls in a ratio of 5 to 1 or more. The two kinds are often taken from the same group in summer, but we are not sure that these represent flock associations or the proximity occasionally inevitable for birds which are so numerous and alike in habit. We expected and found *hornemanni* in greater proportions on the open hillsides than in the willows, but the difference is not numerically determined. At Anaktuvuk we can not distinguish between the nests without the adult birds. We did not find occupied nests on the "Ahlasuruk." One specimen of *hornemanni* had her breast bare as for brooding. The two males had large (7 mm) testes on

June 24. At the end of June a group of a dozen redpolls flew together as a flock and such groups were more often seen in July. The inclination for flock association begins to appear very soon after redpolls have nested. Two males and one female specimens weighed 12, 12, and 13 grams and were identified as *A. h. exilipes* (Coues).

COMMON REDPOLL: **Acanthis flammea** (Linnaeus)

Many redpolls of this form were seen on the "Ahlasuruk." A male on June 24 had large (7 mm) testes; in one on July 5 they were somewhat smaller (5 mm). A female on June 23 had evidently laid and contained eggs only 2 mm long. The three weighed 14, 15, and 16 grams, which are among the heaviest redpolls we have found. At Anaktuvuk there is no distinction in weight of individuals in large series of the two redpolls. The three specimens were identified as *A. f. flammea* (Linnaeus).

SAVANNAH SPARROW: **Passerculus sandwichensis** (Gmelin)

Savannah sparrows were common in marshy places along the "Ahlasuruk." On July 2 they were carrying food, but the young birds were not seen. A week later the young were seen flying. Three single individuals were seen May 25, 1952, in Howard Pass. A male specimen taken July 2, 1953, had testes 11 mm in length, weighed 20 grams, and was identified as *P. s. anthinus* (Bonaparte).

TREE SPARROW: **Spizella arborea** (Wilson)

Tree sparrows were less numerous than Alaska longspurs and more numerous than redpolls. They keep to the proximity of willow but even an occasional small bush seems to suit them. Young birds were just flying on July 2, and on July 7 they flew well.

WHITE-CROWNED SPARROW: **Zonotrichia leucophrys** (Forster)

These sparrows were numerous in the willows on the valley floor and in many small patches 500 feet higher in the mountains. They were seen along the Noatak May 25, 1953. On July 2 young birds were first seen just able to fly but the males frequently sang after that date and the family groups were associated in mid July. One male specimen was identified as *Z. l. gambeli* (Nuttall).

FOX SPARROW: **Passerella iliaca** (Merrem)

Fox sparrows were seen and heard singing along "Otirgon" Creek among thick willow brush where the gray-cheeked thrush were found. They emerged only briefly from dense cover.

ALASKA LONGSPUR: **Calcarius lapponicus** (Linnaeus)

At times longspurs were estimated to be 100 times as numerous as any other bird seen. In June they were in every situation in the valley but most numerous over the great extent of niggerhead terrain. After 10 o'clock in the evening some were still moving about. On July 2 the young birds were first flying and the male adults had started to moult. Soon afterward the young birds flew well, became independent and the adults grew more retiring. They do not thereafter appear more numerous than the Tree Sparrows. On May 25 and 26, 1952, great numbers of migrant longspurs were in Howard Pass and a female specimen was identified as *C. l. alascensis* Ridgway.

SNOW BUNTING: **Plectrophenax nivalis** (Linnaeus)

A few snow bunting were in Howard Pass on May 25 and 26, 1952. These were evidently late migrants for none were seen in summer. A male and female specimen were identified as *P. n. nivalis* (Linnaeus).

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MYCOLOGY.—*Morphological features shown in* Aphanomyces *isolations from roots of spinach and flax.* CHARLES DRECHSLER, United States Department of Agriculture: Plant Industry Station, Beltsville, Md.

Nearly 20 years ago I noted in a brief abstract (Drechsler, 1935) the isolation of a species of *Aphanomyces* from discolored roots of spinach plants (*Spinacia oleracea* L.) originating in New Jersey and Virginia and from discolored flax roots (*Linum usitatissiumum* L.) collected in northern Wisconsin. Reference was made in the abstract to resemblances that the isolations from spinach and flax bore to *A. cladogamus*, a species I had previously described (Drechsler, 1929) from cultures obtained from tomato rootlets (*Lycopersicon esculentum* Mill.). Subsequently (Drechsler, 1946) in setting forth its antagonistic behavior toward different species of *Pythium* I designated my saprolegniaceous fungus from spinach as a strain of *A. cladogamus*, though an *Aphanomyces* culture isolated from spinach in the Netherlands had under the designation *A. euteiches* P. F. 2 (Meurs, 1928) earlier been assimilated to the congeneric parasite causing root rot of peas (*Pisum sativum* L.). As members of the Saprolegniaceae have been found associated with root rot or root discoloration only in a few of the crop plants grown in greenhouse, garden, or field, the reported occurrence of two congeneric water molds on any one cultivated plant species appears in excess of normal expectations. Unfortunately the *Aphanomyces* culture that Meurs obtained from spinach was not avilable for comparison with my own isolations. Because of restrictions on the importation of pathogenic material a side-by-side comparison of any similar European culture with isolations obtained in the United States might not be readily accomplished in the future. Under the circumstances it may in some degree be helpful to set forth the morphological features that led me to assign my isolations from spinach, as also my conspecific isolations from flax, to *A. cladogamus*.

The morphological features distinguishing the several root-rotting species of *Aphanomyces* are displayed mainly in their sexual reproductive apparatus. Important differences are expressed in the presence or absence of a visible and fairly close mycelial connection between the oogonium and its attendant antheridia; in the measure and manner in which the sexual branches, together often with some concomitant hyphal ramifications, are interlocked or intertwined; in the dimensions of the oogonium and oospore, including not only the diameters of these bodies but also the thickness of the envelopes or walls surrounding them. Since the shape and posture of antheridia are likely to be disturbed more or less in the manipulations necessary for proper microscopical examination of sexual apparatus developed in water cultures, all reproductive units herein figured were taken from maize-meal-agar plate cultures of a consistency firm enough to endure manipulation, yet not too hard for antheridia to grow to their normal size without evident impediment or noticeable deformity. The distribution of fine maize-meal particles through the agar substratum seems helpful in encouraging abundant sexual reproduction, and is more especially advantageous in promoting normal development inside the oogonia, with resultant formation of oospores having the correct internal organization necessary for longevity. Judged from appearances the substances that here promote normal oospore development would seem largely to remain undissolved in the maize-meal particles until these particles are acted upon by mycelial branches close by. At all events the fungi herein discussed, like some species of *Pythium*, will commonly extend numerous hyphal branches among clustered maize-meal particles, and in the somewhat densely permeated regions will then give rise to reproductive units rather close together. Consequently the more or less complicated hyphal relations frequent in sexual reproductive development are often brought into being in regions where relatively intricate hyphal ramification has already come about from nutritional needs. On the upper surface, besides, even in cultures in which growth of aerial mycelium has been meager, some aerial branches will often arise from positions close

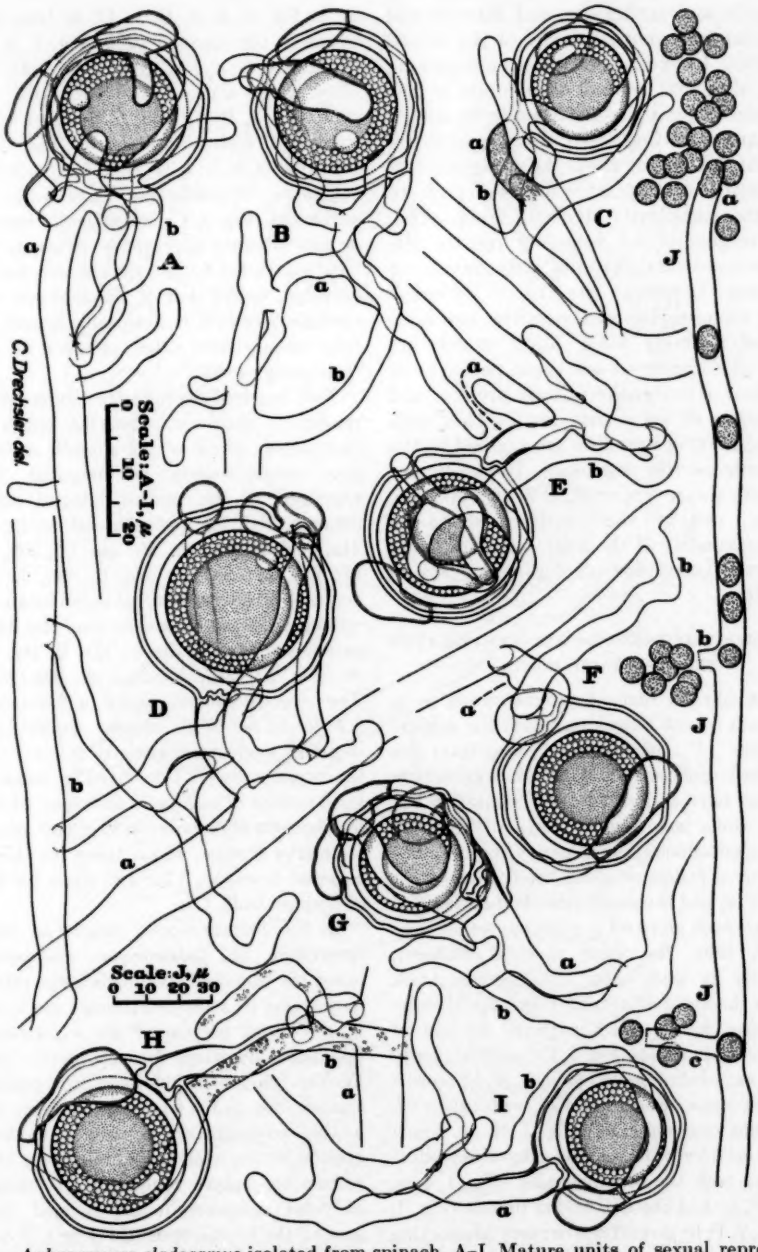

FIG. 1.—*Aphanomyces cladogamus* isolated from spinach. A–I, Mature units of sexual reproductive apparatus produced in maizemeal-agar plate cultures and drawn at a uniform magnification with the aid of a camera lucida; *a*, branch or hypha supplying the oogonium; *b*, branch or hypha supplying the male complement; × 1,000. J, Distal portion of evacuation tube showing encysted zoospores near the 3 openings, *a–c*; × 500.

to oogonia and antheridia, and thereby will add to the apparent intricacy of the sexual apparatus. In preparing the accompanying figures of sexual reproductive units it has been deemed justifiable to obviate the added complexity resulting from aerial growth by using thin slices cut from the under side of maize-meal agar plate cultures, and to avoid the complexity deriving from nutritional exigencies by selecting mostly the reproductive units scattered with convenient sparseness between the more crowded regions where maize-meal particles had been clustered. Among such units many are clearly discernible in all their parts, even where four or five antheridia are present, and where some of the antheridia together with some supporting branches are applied to the under side of the oogonium. Reproductive units with six, seven, or eight antheridia are, however, usually too complicated to be shown accurately at the moderate magnification herein used for all figures of sexual apparatus.

MORPHOLOGY OF THE APHANOMYCES ISOLATED FROM SPINACH ROOTS

In the spinach root-rot fungus, much as in the tomato rootlet fungus on which the original description of *Aphanomyces cladogamus* was based, the oogonium and its attendant antheridia sometimes have a close mycelial connection but at other times lack such connection. Unusually simple monoclinous reproductive units come into being in instances where the oogonial stalk (Fig. 1, F, a) and the single attendant antheridial branch are both given off in positions rather close together, from the same mycelial filament. Frequently in such units the oogonial stalk entwines the antheridial branch spirally, thereby establishing firm contact without the aid of accessory hyphal parts (Fig. 1, F); and frequently too, the antheridial branch (Fig. 2, H, b) bears a few short spurs which interlock variously with the twining oogonial stalk (Fig. 2, H, a). Sometimes in relatively simple monoclinous reproductive units both the oogonial stalk (Fig. 1, I, a; Fig. 2, F, a) and the antheridial branch (Fig. 1, I, b; Fig. 2, F, b) give off one or more interlocking spurs, so that firm contact is provided without entwinement. All terminal antheridial branches enwrap the oogonium rather extensively whether they are supplied (Fig. 1, A, b; B, b; C, b; E, b; G, b. Fig. 2, A, b; C, b; D, b) from the same hypha as the oogonial stalk (Fig. 1, A, a; B, a; C, a; E, a; G, a. Fig. 2, A, a; C, a; D, a) or are given off by a mycelial filament (Fig. 1, D, b; H, b. Fig. 2, B, b; E, b; G, b; I, b) not closely connected with the filament (Fig. 1, D, a; H, a. Fig. 2, B, a; E, a; G, a; I, a) supplying the oogonium. Reproductive units with 4 or 5 antheridia (Fig. 2, C) consequently have a more or less intricate appearance. After its contents have contracted to form the oospore, the oogonial envelope, unlike that of *Aphanomyces euteiches*, commonly relaxes in noticeable degree, and in a fully mature state often presents an irregular undulating profile.

Two hundred reproductive units selected at random in maize-meal agar plate cultures of the New Jersey strain of the spinach *Aphanomyces* gave measurements for oogonial diameter, expressed in the nearest integral number of microns, with the following distribution: 20μ, 2; 21μ, 10; 22μ, 21; 23μ, 29; 24μ, 35; 25μ, 35; 26μ, 37; 27μ, 17; 28μ, 7; 29μ, 6; 30μ, 1. The 200 oospores of correct internal organization in these units gave measurements for diameter distributed as follows: 14μ, 1; 16μ, 1; 17μ, 9; 18μ, 29; 19μ, 39; 20μ, 55; 21μ, 29; 22μ, 28; 23μ, 8; 25μ, 1. The reserve globule varied in diameter from 8.2 to 14.4μ. With respect to thickness the oogonial envelope measured 0.5 to 1.1μ and the oospore wall 1.1 to 2μ. The measurements for diameter of oogonium averaged 24.4μ; those for diameter of oospore, 19.8μ; those for diameter of reserve globule, 11.1μ; those for thickness of oogonial envelope, 0.7μ; and those for thickness of oospore wall, 1.5μ.

In the tomato-rootlet fungus on which the description of *Aphanomyces cladogamus* was based the branched sporangium was often found discharging its zoospores through plural openings in the distal portion of the evacuation tube. Sporangial discharge through plural openings is likewise frequent in the isolations obtained from spinach (Fig. 1, J, a–c), though in many instances all the zoospores are released from the single opening at the axial tip. Immediately after their release the spores round up and encyst. The encysted zoospores found grouped irregularly around the hyphal openings (Fig. 1, J, a–c) from which they have emerged commonly measure about 7.5μ in diameter. It seems probable that the relatively small number of encysted zoospores between 9 and 10μ in diameter may owe their

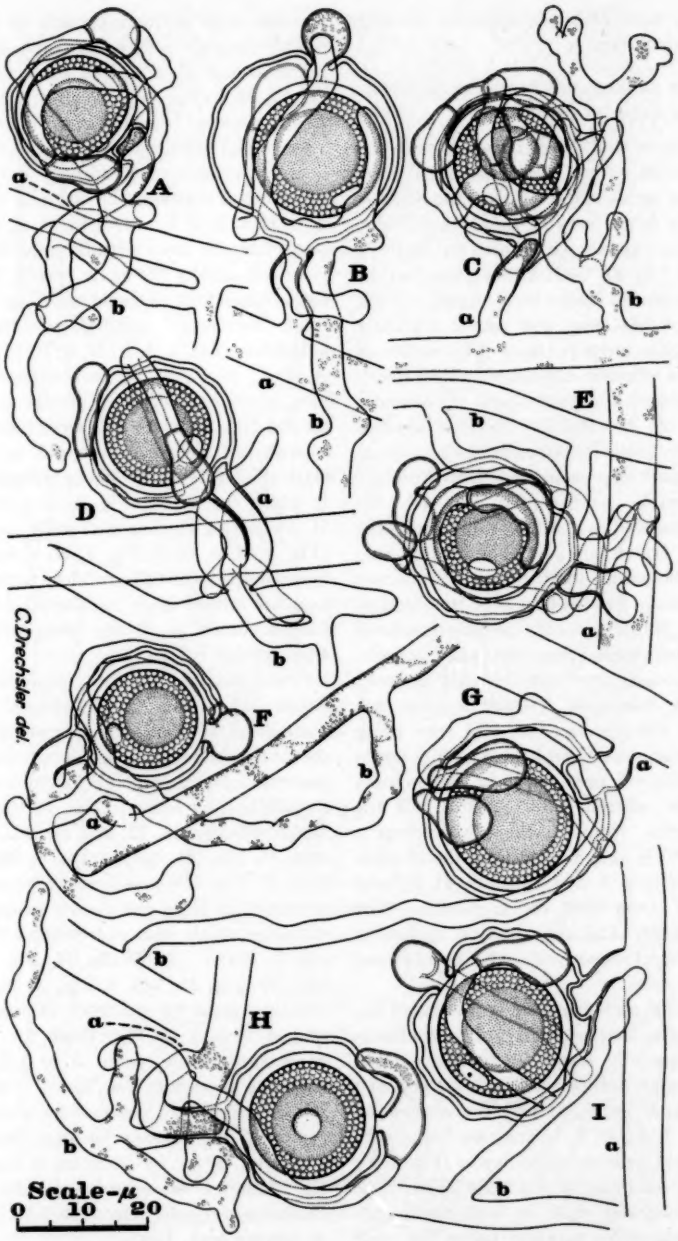

FIG. 2.—*Aphanomyces cladogamus* isolated from spinach; × 1,000 throughout. A–I, Mature units of sexual reproductive apparatus produced in maizemeal-agar plate cultures and drawn at a uniform magnification with the aid of a camera lucida; *a*, branch or hypha supplying the oogonium; *b*, branch or hypha supplying the male complement.

larger size to incomplete protoplasmic cleavage within the sporangium.

MORPHOLOGY OF THE APHANOMYCES ISOLATED FROM FLAX ROOTS

The flax plants that yielded the *Aphanomyces* cultures reported earlier (Drechsler 1935) were taken from a small stand of flax immediately adjacent to a larger area of field peas (*Pisum sativum* L. var. *arvense* (L.) Poir.) in northern Wisconsin on July 10, 1931. As the ground at the time had for several weeks been excessively wet the foliage of the peas was rather markedly yellowed, and the lower portions of the stems, as also the roots, showed extensive cortical decay of the type common in garden peas (*P. sativum*) after attack by *A. euteiches*. The flax likewise had a generally unthrifty appearance which could for the most part have resulted directly from the very unfavorable condition of the soil. No injury was observed in the flax stems above the ground level but when individual plants were pulled up the main root in many instances showed patches of yellowish, orange, and reddish discoloration. When pieces of root thus discolored were placed on sterile maize-meal agar, mycelia of an *Aphanomyces* grew out promptly in many instances. To determine whether a plant not belonging in the Leguminosae was here being attacked by the water mold known mainly for its injurious action on peas, some of the mycelia were used for starting pure cultures. All the cultures readily formed sexual reproductive apparatus, which, as is evident from the 19 units figured herein (Fig. 3, A–J; Fig. 4, A–I), differed conspicuously from that of *A. euteiches*, but resembled closely the reproductive apparatus formed in the *Aphanomyces* cultures obtained from spinach roots.

The oogonium and attendant antheridia of the flax-root fungus are frequently of monoclinous origin. In especially simple reproductive units with only a single antheridium both the oogonial stalk (Fig. 3, C, a; J, a) and the antheridial branch (Fig. 3, C, b; J, b) may be borne subterminally on a main mycelial hypha (Fig. 3, C) or on a short ramification of a main hypha (Fig. 3, J). The oogonial stalk in such units may entwine in noticeable measure either the male branch itself (Fig. 3, C) or a spur borne on it (Fig. 3, J). Oogonia borne on a stalk arising subterminally from a main hypha (Fig. 3, H, a; Fig. 4, D, a; E, a; G, a; I, a) are frequently supplied with plural antheridia of monoclinous origin, the male cells being borne sometimes on ramifications of a single subterminal branch (Fig. 3, H, b. Fig. 4, D, b; G, b; I, b) and sometimes on plural branches given off separately in subterminal positions (Fig. 4, E, b, c). Similarly in monoclinous units formed in other than subterminal positions the oogonial stalk (Fig. 3, A, a; D, a; E, a; F, a; I, a. Fig. 4, A, a; C, a; F, a) arises laterally from a main hypha from which is given off nearby the male branch that bears a single attendant antheridium (Fig. 3, I, b) or more frequently ramifies to supply plural antheridia (Fig. 3, A, b: D, b; E, b; F, b. Fig. 4, A, b; C, b; F, b). In such monoclinous units, also, plural attendant antheridia may be borne on two (Fig. 4, B, b, c) or more branches arising separately from the same hypha as the oogonial stalk (Fig. 4, B, a). Diclinous reproductive units, in which the hypha (Fig. 3, B, a; G, a. Fig. 4, H, a) bearing the oogonial stalk and the hypha (Fig. 3, B, b; G, b. Fig. 4, H, b) supplying the male complement have no close mycelial connection, are formed freely in cultures of the flax-root fungus, much as in the conspecific isolations from spinach roots.

Two hundred mature reproductive units taken at random in maize-meal agar plate cultures of the flax-root fungus gave measurements for diameter of oogonium, expressed in the nearest integral number of microns, with a distribution as follows: 17μ, 1; 19μ, 1; 21μ, 6; 22μ, 9; 23μ, 9; 24μ, 12; 25μ, 38; 26μ, 26; 27μ, 35; 28μ, 25; 29μ, 20; 30μ, 8; 31μ, 4; 32μ, 2; 33μ, 2; 35μ, 2. The 200 oospores of correct internal structure in these units gave measurements for diameter which were distributable thus: 14μ, 1; 16μ, 1; 17μ, 1; 18μ, 5; 19μ, 15; 20μ, 30; 21μ, 58; 22μ, 50; 23μ, 25; 24μ, 8; 25μ, 3; 26μ, 2; 27μ, 1. Measurements for diameter of reserve globule ranged from 8 to 14μ; those for thickness of oogonial envelope, from .5 to 1.2μ; those for thickness of oospore wall, from 1.1 to 1.9μ. From the several sets of measurements averages were computed as follows; for diameter of mature oogonium, 26.3μ; for diameter of oospore, 21.3μ; for diameter of reserve globule, 10.9μ; for thickness of oogonial envelope, 0.9μ; for thickness of oospore wall, 1.5μ.

In sporangia of the flax-root fungus, just as in sporangia of the fungus isolated from spinach, the hypha destined to serve as evacuation tube often is furnished below its bluntly rounded tip (Fig. 4,

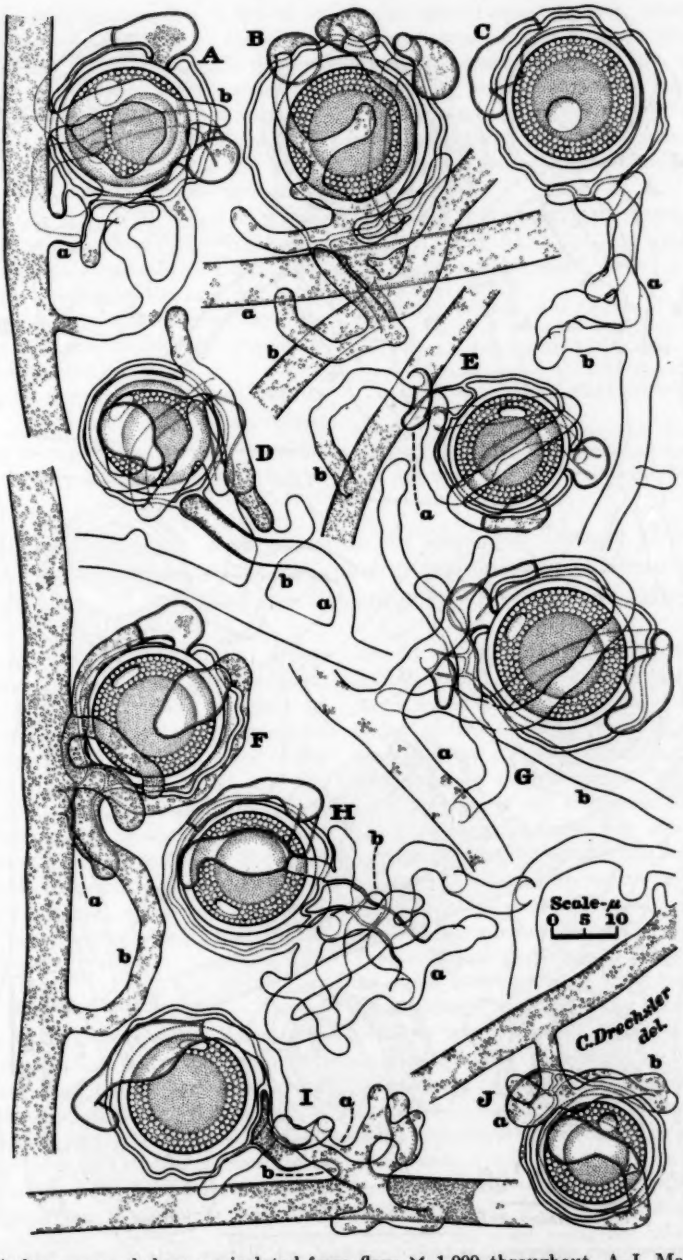

FIG. 3.—*Aphanomyces cladogamus* isolated from flax: × 1,000 throughout. A–J, Mature units of sexual reproductive apparatus produced in maizemeal-agar plate cultures and drawn at a uniform magnification with the aid of a camera lucida; *a*, branch or hypha supplying the oogonium; *b*, branch or hyphae supplying the male complement.

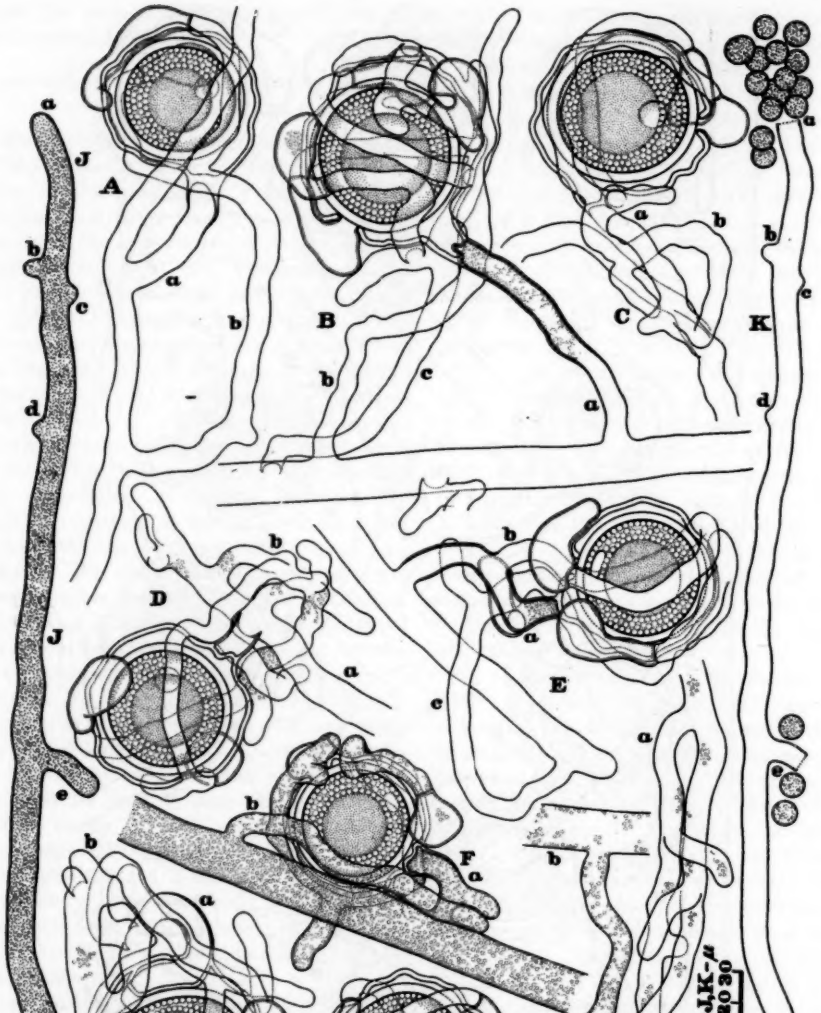

FIG. 4.—*Aphanomyces cladogamus* isolated from flax. A–I, Mature units of sexual reproductive apparatus produced in maizemeal-agar plate cultures and drawn at a uniform magnification with the aid of a camera lucida; *a*, branch or hypha supplying the oogonium; *b* (also *c* in B and E), branch or hypha supplying the male complement; × 1,000. J, Distal portion of evacuation tube; *a*, tip; *b–d*, lateral protuberances; *e*, short branch; × 500. K, Same after sporangium was discharged, showing some encysted zoospores near the openings at *a* and *e*; *b–d* remained closed; × 500.

J, a) with a few protuberances (Fig. 4, J, b–d) or short spur-like branches (Fig. 4, J, e). Frequently when the axial tip (Fig. 4, K, a) yields to allow emergence of the individualized zoospores one (Fig. 4, K, e) or more of the lateral protrusions likewise gives way apically, so that discharge of the sporangium takes place through plural openings. In many instances some protrusions remain closed (Fig. 4, K, b–d). Where all protrusions remain closed, or where no protrusions are present, the zoospores necessarily are discharged from the single opening at the axial tip. After they have rounded up and encysted near the openings (Fig. 4, K, a, e) the zoospores commonly measure about 7.5μ in diameter.

The isolations from roots of spinach and flax thus agree satisfactorily with *Aphanomyces cladogamus* in the morphology of their sporangia and zoospores. They are held properly referable to that species more especially, however, because of close resemblances in their sexual reproductive apparatus—resemblances evident in all main dimensions, in the frequent monoclinous origin of reproductive units, and in the arrangement of the oogonium and its attendant antheridia as well as of the hyphae or branches supplying these organs.

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ENTOMOLOGY.—*A new cryptine genus of economic interest (Hymenoptera: Ichneumonidae).* LUELLA M. WALKLEY, Entomology Research Branch, U. S. Department of Agriculture. (Communicated by C. F. W. Muesebeck.)

The new genus, described below, superficially resembles *Ischnus* Gravenhorst, 1829 (Ichn. Europaea **1:** 638) but may be readily separated from it by the shape of the ovipositor (Fig. 1, *a*, *b*), the shape of the male genital sheaths (fig. 1, *c*, *d*), and the lack, in both sexes, of a pale annulus on the antenna. Even more significant is the fact that it differs biologically since the only known species parasitizes sawflies, whereas all species of *Ischnus*, so far as is known, parasitize Lepidoptera, particularly the Olethreutidae.

Pseudischnus, n. gen.

Genotype: (*Ischnus oregonensis* Cushman) = *Pseudischnus oregonensis* (Cushman) n. comb.

Head broader than thorax, temples somewhat convex but sloping inward and about one-half as long as width of eye when viewed dorsally; clypeus about twice as wide as long and convex with a more or less truncate but slightly sinuate anterior margin; antennae without annulus.

Mesoscutum with notaulices sharp and distinct to at least its center; upper lateral margins of pronotum visible when viewed from above; propodeum with only the basal transverse carina distinct and complete, the apical carina broadly interrupted in the middle, the propodeal spiracle round in the male, slightly oval and larger in the female; female propodeum with the dorsal surface usually short or at least shorter than posterior surface and meeting the posterior surface at an angle of about 120 degrees; the male propodeum not differentiated into dorsal and posterior surfaces but gently sloping; petiole of female flat dorsally and strongly curved near or just before spiracles, the postpetiole fully three times as broad as base of petiole, with dorsolateral carinae becoming dorsal on the postpetiole and varying from strong and distinct to rather weak; petiole of male less curved and more slender with postpetiole scarcely twice as wide as base of petiole and with dorsolateral carinae indistinct or missing.

Areolet of forewing with sides convergent, the second intercubitus often indistinct and in some cases apparently missing, the areolet then being open.

Ovipositor sheaths about two-fifths length of abdomen; apex of ovipositor strongly curved dorsally, the point being not more than three times as long as broad at base (Fig. 1, *a*); male genital sheaths with the visible part very slender (Fig. 1, *c*).

Pseudischnus will key to *Ischnus*, couplet 29,

in Pratt's key to Nearctic genera of Cryptini (Pratt, Amer. Midl. Nat. **34** (3): 558–560. 1945). The second half of couplet 29 may be modified as follows making it referable to an additional couplet also given below:

29. ——
Propodeum with basal carina stronger than apical carina, the latter represented only laterally; propodeal spiracles circular 33

30. ——
31. ——
32. ——
33. Nervellus broken slightly below middle with anterior end farther from wing base than posterior end; base of petiole usually with lateral triangular projections..... *Ischnus*
Nervellus broken far below middle (at least at the posterior two-thirds) with anterior end closer to wing base than posterior end; base of petiole without lateral triangular projections..... *Pseudischnus*

In color and general conformation members of this new genus can be easily mistaken for *Ischnus*. Closer observation, however, shows that *Pseudischnus* has: (1) the petiole flatter in its basal two-thirds and more strongly bent with its spiracles closer to the apex; (2) the propodeum with an areola suggested, in the female, by the plane of the propodeum in that area, and in the male usually by a difference in sculpture in the area; (3) the mesoscutum at least as broad as long (in *Ischnus* it is longer than broad); (4) the pronotum less evident when viewed from above.

Ischnus as considered here is *Ischnus* of the genotype (*Ischnus inquisitorius* (Mueller)). However, all the species in the U. S. National Museum collection included in the genus have been studied. Some of the species, described and undescribed, agree with *Pseudischnus* in one or more of the characters discussed above but never in the shape of the ovipositor or of the genital sheaths.

The type series of *Pseudischnus oregonensis* (Cushman) contains specimens from Oregon and Montana reared from *Neodiprion tsugae* Middleton (Cushman, Journ. Washington Acad. Sci. **29** (9): 391–393. 1939). Later the species was found in Idaho and now specimens recently received from California extend the range southward. The California specimens were reared from *Neodiprion* sp., which is probably that previously identified as *Neodiprion tsugae* Middleton.

The species *oregonensis* varies in the extent of the pale coloring on the male though the general pattern is constant. The extent of reddish color on the propodeum of the female also varies. Some specimens have the areolet of the forewing incomplete or open; in fact, in some cases one forewing will have a closed areolet and the other an open one. The size, especially of the female, also varies somewhat, the smallest specimen in the collection of the U. S. National Museum being approximately 6 mm. long and the largest specimen about 8 mm. long.

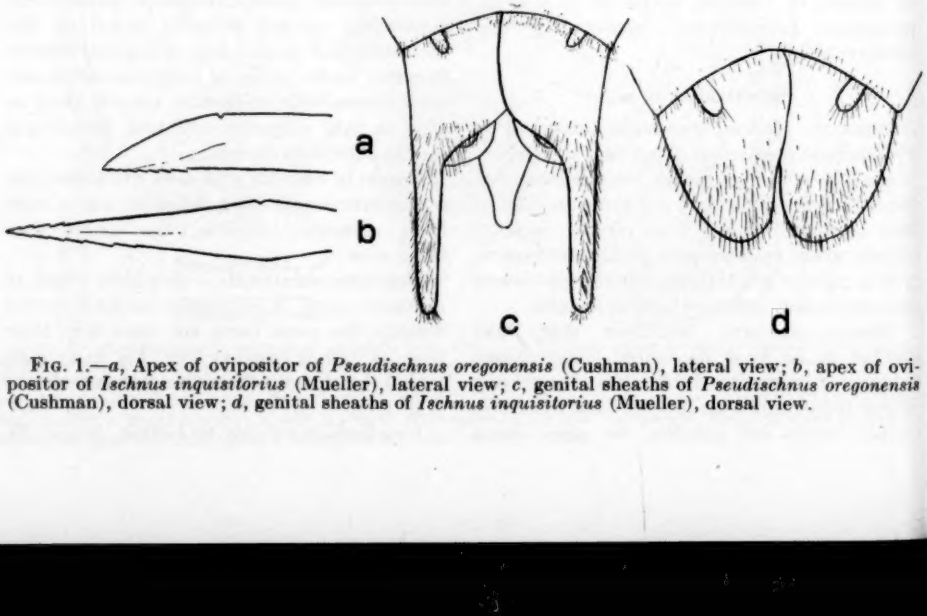

FIG. 1.—*a*, Apex of ovipositor of *Pseudischnus oregonensis* (Cushman), lateral view; *b*, apex of ovipositor of *Ischnus inquisitorius* (Mueller), lateral view; *c*, genital sheaths of *Pseudischnus oregonensis* (Cushman), dorsal view; *d*, genital sheaths of *Ischnus inquisitorius* (Mueller), dorsal view.

ENTOMOLOGY.—*Notes on some species of the* Amata (Syntomis) cymatilis *group from the Philippine Islands, with description of a new species (Lepidoptera: Ctenuchidae).* NICHOLAS S. OBRAZTSOV, Sea Cliff, L. I., N. Y. (Communicated by William D. Field.)

The Philippine moth *Amata cymatilis* (Swinhoe) was regarded as a very variable species with characters independent of geographic distribution (Semper, 1898). Hampson (1898) considered *Syntomis laomedia* Druce a synonym for *cymatilis*; Seitz (1913) described and figured a new aberration of *cymatilis* which he named ab. *orthrus* Seitz. A first step in the separation of a new species in the *cymatilis* group was made by Wileman (1916) who described *Amata mindamaoensis* Wileman based on a female specimen.

Through the courtesy of J. F. Gates Clarke and W. D. Field, of the U. S. National Museum in Washington, the author of the present paper had an opportunity to study a large series (162 specimens) of moths in this museum, identified as *cymatilis*. This examination permitted the author to ascertain that the group in question consisted of three independent species: *cymatilis* Swinhoe, *laomedia* Druce and *bryopoda*, n. sp. Figures of the last of these species were already published but wrongly identified by Semper (1898) as *cymatilis*. All three species are very similar to one another and in a mixed series give the impression of a common, rather variable species. On the basis of genitalia and some external characters, they should be identified as independent species.

The most important character which differentiates the *cymatilis* group from the rest of *Amata* species is a large area of androconial scales on the under wing surface in the male. In the androconial scaling of legs in the male, two species of the group are related to the species *sublutea* Beth.-Baker and *teinopera* Hampson. The remaining features are not so typical for the group and can be found in some other species of the genus.

The distinguishing features of the species of the *cymatilis* group are as follows:

1. The frons (if patched) is in both sexes
   (a) white—*cymatilis bryopoda*;
   (b) yellow—*laomedia*.
2. The pectus has yellow lateral patches only in some male specimens of *laomedia*; mostly it is entirely black in all three species.
3. Patagia are yellow only in some specimens of *laomedia*; mostly they are black in all three species.
4. Legs with androconial scaling in the male:
   (a) on the fore tibiae and femora—*cymatilis*;
   (b) on the middle tibiae and femora—*cymatilis, bryopoda*;
   (c) on the hind femora—*bryopoda*;
   (d) without any androconial scaling—*laomedia*.
5. The inner side of the fore coxae is whitish yellow only in *bryopoda*.
6. The first abdominal tergite is yellow only in some specimens of *laomedia*.
7. The fifth abdominal sternite is yellow banded in all three species, but in *bryopoda* this pigmentation is sometimes reduced to two lateral spots.
8. The fifth abdominal tergite in *bryopoda* alone is never yellow banded; in both other species, it is either banded or not.
9. The androconial scaling of the under surface of the forewing of the male
   (a) reaches or almost reaches the exterior subcostal spot (m_4)—*laomedia, bryopoda*;
   (b) is separated from the spot m_4 by a normally scaled area—*cymatilis*.
10. In the forewing of the male
   (a) both the lower external spots (m_5 and m_6) are equally remote from the middle cell—*cymatilis, bryopoda*;
   (b) the spot m_6 is nearer to the middle cell than the spot m_5—*laomedia*.
11. In the hind wing the basal spot is
   (a) irregularly subcordate—*cymatilis*;
   (b) slightly elongate—*bryopoda*;
   (c) roundish in most females of *laomedia*;
   (d) dotlike only in some female specimens of *cymatilis* and some male specimens of *laomedia*;
   (e) absent in some females of *cymatilis*, rarely in the females of *laomedia* but often in the males, usually absent in the males of *bryopoda* but always present in the females.
12. The distal spot of the hind wing is
   (a) larger than the basal one only in the females of *laomedia*;
   (b) dotlike in the females of *cymatilis* and some females of *bryopoda*;
   (c) always absent in the males of *laomedia, cymatilis* and *bryopoda* but present in the females of the last of the mentioned species and *laomedia*, often present also in the females of *cymatilis*;
   (d) elongate only in the females of *bryopoda*.

The genitalia are very typical for each of the three species of the *cymatilis* group and their distinguishing features are clearly seen from descriptions and figures reproduced below.

Amata (Syntomis) cymatilis (Swinhoe)

Figs. 3, 9–11

Syntomis cymatilis Swinhoe, Cat. East. and Austral. Het., **1**: 40. 1892; Zerny, Wagner's Lep. Cat. **7**: 20. 1912.

Male.—Antennae simple, black, short white tipped above, brownish yellow beneath. Head black, usually with a bluish reflection; frons sometimes with a slightly whitish scaling. Patagia black; tegulae black with shoulders blue reflecting. Thorax brown black; pectus usually with a blue or violet reflection. Legs brown with a greenish or violet reflection; inner surface of the fore and middle tibiae and femora with a lighter brownish androconial scaling but this scaling is not or almost not visible from above. Abdomen dark lustrous blue, rarely dull brownish black on the ventral surface; fifth segment completely encircled by a yellow girdle or with such a band only on the ventral surface.

Wings black with a more or less developed blue reflection; forewing with five white-hyaline spots and sometimes a sixth little dot (m_3); hind wing with a basal spot only. The under surface of both wings with a well-developed, pale brownish, androconial scaling. In the forewing this scaling occupies the external wing part, from the spot m_1 and outward from the spots m_4–m_6, and fills uninterruptedly out the interspace between the middle cell and dorsum and the subterminal interspace from the costa to the tornus forming between the veins M_1 and M_2 a ray toward the middle cell. The inner border of this androconial area does not reach the lower border of the middle cell and is more or less remote from the spot m_4 leaving a normally scaled area behind it. In the hind wing the androconial scales occupy the whole terminal area beyond the basal spot and the middle cell and only extend as separate, more or less long rays into the basal wing part. Length of the forewing: 12–16 mm.

The basal spot (m_1) of the forewing subquadrate, rather large; spot (m_2) in the middle cell shortly trapezoid or subquadrate; the subcostal exterior spot (m_4) small or rather large, ovate or roundish; both the lower exterior spots (m_5 and m_6) elongate, equally remote from the middle cell; the exterior supradorsal spot (m_3) sometimes present as a little dot near the dorsum, in front of the middle of the middle cell. The basal spot of the hind wing irregularly subcordate, indented on the outer side.

Female.—Similar to the male but without the androconial scaling on legs and wings. The spot m_1 of the forewing sometimes smaller; the spot m_3 well developed, variously shaped: oval, rhomboid, or irregular; the spots m_4-m_6 more elongate. In the hind wing besides the basal spot (which is sometimes absent) a little distal dot beyond the lower angle of the middle cell is often present; it is more or less separated from the basal spot. A white patch on the frons is sometimes well developed.

Male genitalia.—Uncus slender; lateral appendages of the tegumen narrow, almost direct. Right valva (Fig. 9) with a broad based, free pointed sacculus; distal part of the valva bilobate, the upper lobe enlarged at tip, the lower one narrow but longer. Left valva (Fig. 10) with a broad based, short free pointed sacculus; distal part of the valva pointed, with a less developed upper angle. Processes basales of both valvae narrow, the right slightly shorter than the left one. Aedoeagus as in *brycpoda* (cf. hereinafter).

Female genitalia.—Lateral parts of the seventh tergite rounded; plate of the eighth sternite broad, proximally with a flat, roundish area, distally rather narrowly notched; the latero-distal angles of this plate broad, rounded. Ostium bursae slightly displaced to the right, distinctly separated from the plate of the eighth sternite; ductus bursae sclerotized more than a half of its length; corpus bursae with a longitudinal stippling.

Remarks.—The original description of *cymatilis* mentioned in addition to other characters a lustre reflection of legs and wings not only on the outer surface but also on the under surface, in the wing areas free of androconia. This character, in combination with a complete, yellow girdle on the fifth abdominal segment in the female is typical only for the species redescribed above as *cymatilis*. The complete girdle itself in *cymatilis* is not a specific feature because of its inconstant presence in all specimens and in the studied materials it has been observed only in two males and two females from Bilaran, two males and two females from St. Cruz and one female from Cabuntug. In each of the two latter localities there was found

one female specimen with yellow bands only on the ventral surface of the abdomen. This character in *cymatilis* is evidently variable as in *laomedia*. Both the forms of *cymatilis*, a completely and an incompletely banded one, are identical in the genitalia.

The following material in the U. S. National Museum was studied:

MINDANAO: Surigao, 2 ♂♂, 3 ♀♀ (May).
LUZON: Mount Mikiling, 3 ♂♂ (Baker; preparations of genitalia nos. 4540 and 4543, W.D.F.); Mount Drid, Rizal Province, 1 ♂ (November

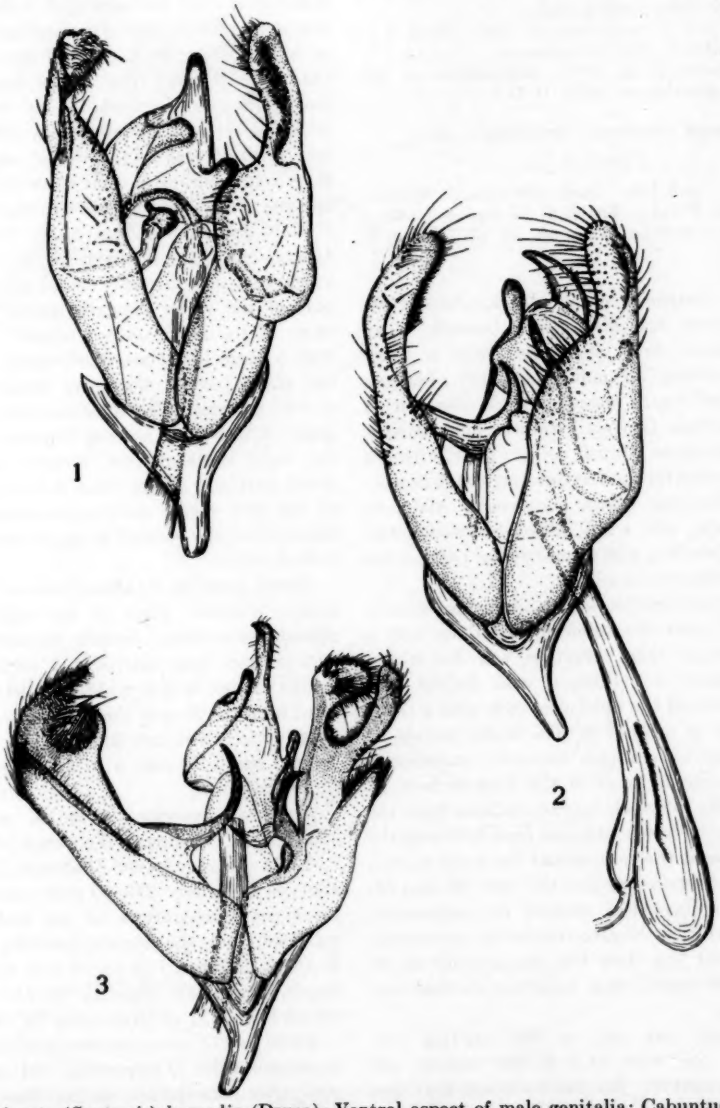

FIG. 1.—*Amata* (*Syntomis*) *laomedia* (Druce): Ventral aspect of male genitalia; Cabuntug, Siargao (September 18, 1916, preparation no. 4527, W.D.F.). FIG. 2.—*A.* (*S.*) *bryopoda*, n. sp.: Ventral aspect of male genitalia; Monuangon, Mindanao (February 24, 1915, preparation no. 4536, W.D.F.). FIG. 3.—*A.* (*S.*) *cymatilis* (Swinhoe): Ventral aspect of male genitalia; St. Cruz, Leyte (October 13, 1915, preparation no. 4544, W.D.F.).

1926); Bilaran, 2 ♂♂, 3 ♀♀ (October 21, 1915; September 28, 1918; preparation of the male genitalia no. 4539, W.D.F.); Los Baños, 1 ♂, 1 ♀ (February 25, 1914, Baker); Mount Banahao 1 ♂, 1 ♀ (June 15, 1914; August 18, 1916).

LEYTE: St. Cruz, 2 ♂♂, 3 ♀♀ (October 11–14, 1915; one couple in copula; preparation of the male genitalia no. 4544, W.D.F.); Burauen, 1 ♂, 1 ♀ (May 4 and 5, 1915).

SIARGAO: 2 ♀♀ (September 9, 1916); Dapa, 1 ♂ (November 6, 1916); Cabuntug, 2 ♂♂, 2 ♀♀ (September 14–18, 1916, preparation of the female genitalia no. 4545, W.D.F.).

Amata (Syntomis) bryopoda, n. sp.

Figs. 2, 4, 7, 8

Syntomis cymatilis (non Swinhoe) Semper, Schmett. Philipp. **2**: 419, pl. 53, figs. 4–5, 1898; ? Seitz, Gross-Schm. Erde **10**: 79, pl. 11h, fig. 1. 1913.

Male.—Antennae simple, black, short white tipped above, brownish yellow beneath. Head black brown; frons sometimes with a white scaling forming an indistinct patch. Patagia, tegulae, and thorax brownish black, often with a blue reflection. Legs dark brown; inner surface of the fore coxae whitish yellow; middle femora and tibiae and the hind femora very rough densely scaled with pale brown androconia. Abdomen brown black, with a dull, bluish or violet reflection; fifth sternite with lateral yellow patches not seldom connected in a band.

Wings brownish black, the hind wings usually somewhat paler; the forewing sometimes with a dull, bluish or violet reflection, with five white-hyaline spots; sometimes a sixth dotlike spot (m_3) is present; the hind wing only with a small basal spot or without it. The under surface of both wings with a pale brownish androconial scaling occupying most of the wing surface. In the forewing the whole supradorsal area from the spot m_1 to the tornus, the area from tornus to the costa between the termen and the spots m_4–m_6, and the interspace between the veins M_1 and M_2 to the middle cell is covered by androconia. In the hind wing the area covered by androconia occupies not less than the two exterior thirds of the whole wing surface. Length of the forewing: 13–16 mm.

The basal spot (m_1) of the forewing subquadrate; the spot (m_2) in the middle cell elongate trapezoid; the middle supradorsal spot (m_3) only occasionally present, dotlike; the exterior spots (m_4–m_6) more or less elongate, the upper of them (m_4) usually the broadest. The spot of the hind wing very small, generally slightly elongate, usually absent.

Female.—Similar to the male but without androconia. The wing spots, especially the exterior ones (m_4–m_6) in the forewing, larger; the spot m_3 of the forewing well developed, roundish or oval; the basal spot in the hind wing always present, dotlike as in some male specimens or larger, elongate; the distal spot (absent in the male) dotlike. The yellow band on fifth abdominal sternite presented by two separate lateral spots, occasionally by a diffuse yellow scaling along the postsegmental edge; sides of the seventh sternite and the edges of the genitalic opening often slightly yellowish scaled.

Male genitalia.—Uncus rather thick; lateral appendages of the tegumen slightly bent. Right valva with a moderately broad sacculus; distal part of the valva elongate, simple; the upper angle of the valva underdeveloped. Left valva with a large based sacculus slightly pointed at tip; distal part of the valva shaped like that of the right valva but somewhat broader; upper angle of the valva absent. Processus basalis of the right valva narrow, almost direct in its distal part and longer than the bent processus of the left valva. Aedoeagus enlarged in the direction of the coecum penis; cornuti a row of little spines.

Female genitalia.—Lateral parts of the seventh tergite rounded; plate of the eighth sternite almost subcordate, distally broadly notched, with rather long laterodistal angles. Ostium bursae almost in the middle, indistinctly separated from the plate of the eighth sternite; ductus bursae sclerotized only in the distal third of its length; corpus bursae with an indistinct longitudinal stippling.

Remarks.—Described from a series from Monuangon, Mindanao (February 16 to March 7, 1915). Male holotype (February 27), female allotype (February 23), 39 male and 12 female paratypes (preparations of the male genitalia no. 4536 and the female genitalia no. 4546, W.D.F.). Further, 1 ♂ and 3 ♀♀ from Kolambugan, Mindanao (January 22–24, 1915) and Island Panaon, 1 ♂ (November 26, 1915).

There are 17 more specimens of an uncertain taxonomic value (? subspecies) but undoubtedly conspecific with the new species. They differ by a distinctly white patched frons, a broad yellow band on the fifth abdominal sternite, and the basal spot of the hind wing larger, in some

female specimens with a little additional dot beyond the lower angle of the middle cell. This series is as follows:

MINDANAO: Surigao, 7 ♂♂, 7 ♀♀ (May 21 and 28, 1915; November 12, 1915; August 8–30, 1916; preparation of the male genitalia no. 4541, W.D.F.); Butuan, 1 ♂ (June 4, 1915).

LUZON: Los Baños, 1 ♀ (Baker).

PHILIPPINES: 1 ♀.

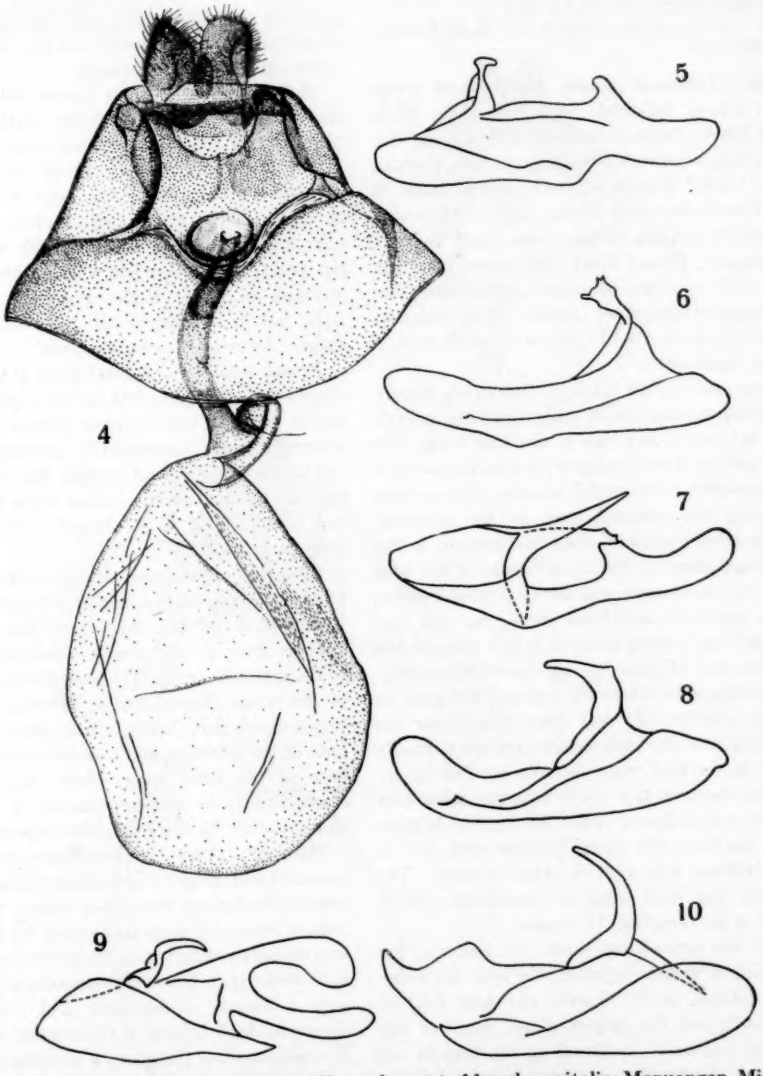

FIG. 4.—*Amata* (*Syntomis*) *bryopoda*, n. sp.: Ventral aspect of female genitalia; Monuangon, Mindanao (February 22, 1912, preparation no. 4546, W.D.F.).
FIG. 5.—*A.* (*S.*) *laomedia* (Druce): Inner surface of the right valva.
FIG. 6.—Idem: Left valva.
FIG. 7.—*A.* (*S.*) *bryopoda*, n. sp.: Inner surface of the right valva.
FIG. 8.—Idem: Left valva.
FIG. 9.—*A.* (*S.*) *cymatilis* (Swinhoe): Inner surface of the right valva.
FIG. 10.—Idem: Left valva.

Amata (Syntomis) laomedia (Druce)
Figs. 1, 5, 6, 12

Syntomis laomedia Druce, Ann. Mag. Nat. Hist. (6) **15**: 43. 1895.
Syntomis cymatilis (non Swinhoe) Hampson, Cat. Lep. Phal. **1**: 76, fig. 35. 1898; (part.) Zerny, Wagner's Lep. Cat. **7**: 20. 1912.
Syntomis cymatilis ab. *orthrus* Seitz, Gross-Schm. Erde **10**: p. 79, pl. 11h, fig. 2. 1913.
Amata mindanaoensis Wileman, Entomologist **49**; 132. 1916.

Male.—Antennae simple, black, short white tipped above, brownish yellow beneath. Head brown black; frons sometimes with a yellowish spot. Patagia brownish black or yellow. Tegulae brown black, sometimes with yellow hairs at tips. Thorax brownish black; pectus often with two yellow patches on each side. Legs smooth, dark brown, almost black. Abdomen brownish black with a violet or bluish green reflection; first tergite sometimes yellow, fifth segment completely girdled with yellow or with such a ventral band only.

Wings dull brown black to black; six (rarely five) white-hyaline spots in the forewing; a little basal dot or not any one in the hind wing. The under surface of both wings with a well-developed pale brownish androconial scaling. This scaling occupying the external part of the forewing extends from the costa, apex and termen to the tornus and dorsum; the inner border of the area scaled by androconia reaches or almost reaches to the spot m_4 and both spots, m_5 and m_6, forming a ray toward the middle cell between the veins M_1 and M_2 and fills up almost completely the interspace between the dorsum, the spot m_1 and the middle cell; only some veins near the inner border of the androconial area are normally scaled. In the hind wing the area covered by androconia occupies the whole external wing part and forms a scalloped inner border which stops rather far from the basal hyaline spot (or its place because this spot is often absent). The costa of the hind wing is sometimes yellow. Length of the forewing: 11–15 mm.

Both the supradorsal spots (m_1 and m_3) are the smallest in the forewing; the spot m_3 sometimes dotlike, rarely absent; the spot (m_2) in the middle cell the largest of all, more or less elongate trapezoid, as broad as the middle cell but much shorter than it; the subcostal exterior spot (m_4) broader but not shorter than both the lower exterior spots (m_5 and m_6); the spot m_6 nearer to the middle cell than the spot m_5.

Female.—Similar to the male but without androconial scaling. All spots larger, especially the spots m_3–m_6; the spot m_6 not nearer the middle cell than the spot m_5. The basal spot of the hind wing small although larger than in the male, rarely absent; an oval distal spot beyond the lower angle of the middle cell. The yellow band on the fifth abdominal segment reduced sometimes to lateral spots; not any of examined specimens had yellow patagia.

Male genitalia.—Uncus rather thick; lateral appendages of the tegumen rather broad, distally rounded. Right valva with a sacculus rather moderately thickened at the base and without a free point; distal part of the valva elongate, simple; upper angle narrow. Left valva with a rather narrow sacculus with a little free tip point; the entire left valva rather narrow, without an upper angle. Processes basales of both valvae thickened at tips, the left one longer. Aedoeagus as in *bryopoda*.

Female genitalia.—Lateral parts of the seventh tergite directly cut; plate of the eighth sternite rather narrow, with narrow laterodistal parts. Ostium bursae considerably displaced to the right, distinctly separated from the plate of the eighth sternite; ductus bursae sclerotized some less than a half of its length; corpus bursae irregularly stippled.

Remarks.—In the original diagnosis of *laomedia* Druce (1895) mentioned the abdomen banded with yellow at the base and this character appears only in the above redescribed species of the *cymatilis* group. The absence of a reflection of the wings (Druce wrote: "Primaries black," "secondaries deep black"), a square spot at the base of the forewing and a small one close to the base of the hind wing, black legs, all these characters favor the application of the name *laomedia* only for the redescribed species.

Hampson (1898) misidentified *laomedia* for *cymatilis* and ranged it as a synonym to this latter species. He figured the species from a male specimen in which the wing area scaled by androconia was evidently defected or underdeveloped. There is no doubt that *Amata mindanaoensis* Wileman is only a female of *laomedia* and therefore its synonym. Very typical in the original description of *mindanaoensis* there was a mention of the spot in the hind wing as "an elongate hyaline spot beyond the lower angle of cell." Only in *laomedia*, a well developed distal spot of the hind wing could be presented and, at the same time, the

basal spot absent. The specimen, described and pictured by Seitz (1913) as *Syntomis cymatilis* ab. *orthrus*, was also a female of *laomedia* because of two separate spots on the hind wing.

The following specimens of *laomedia* were at hand:

MINDANAO: Monuangon, 29 ♂♂, 4 ♀♀ (February 22 to March 4, 1915; preparations of the male genitalia nos. 4528 and 4537, W.D.F.); Butuan, 5 ♂♂, 2 ♀♀ (June 1–5, 1915; preparations of the male genitalia nos. 4538 and 4542; female genitalia no. 4547, W.D.F.); Kolambugan, 1 ♀ (January); Surigao, 1 ♀ (August 8, 1916).

LEYTE: St. Cruz, 3 ♂♂ (October 13–14, 1915); Burauen, 1 ♂, 1 ♀ (May 3, 1915).

SIARGAO: Cabuntug, 2 ♂♂, 1 ♀ (September 10–18, 1916; preparation of the male genitalia no. 4527, W.D.F.).

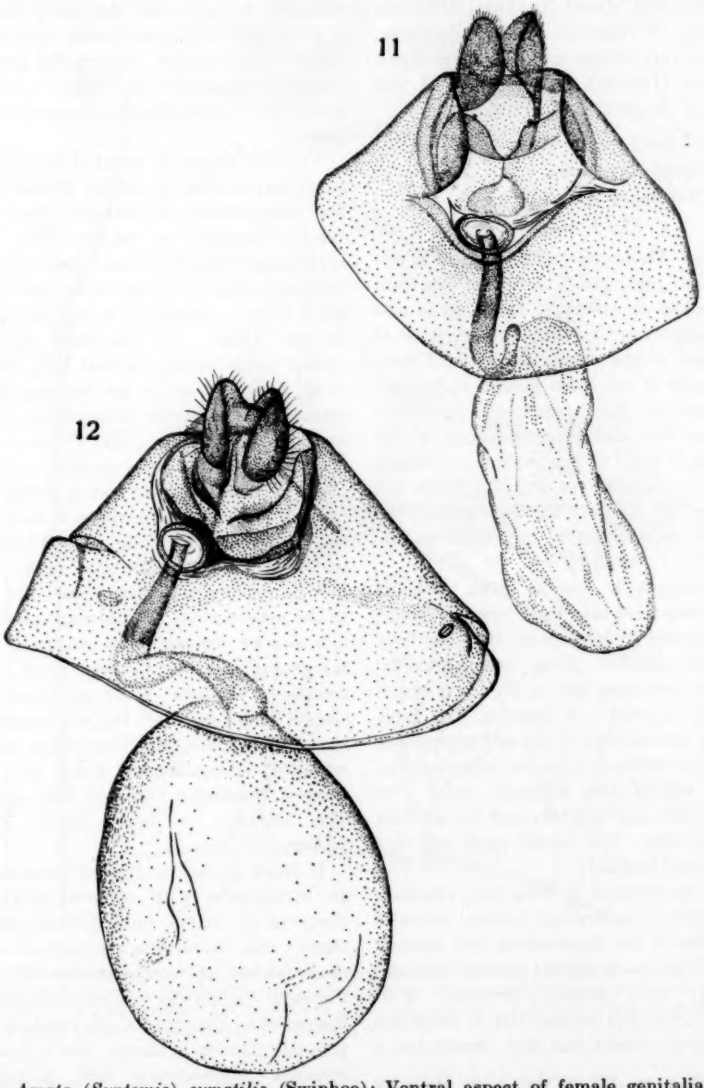

FIG. 11.—*Amata* (*Syntomis*) *cymatilis* (Swinhoe): Ventral aspect of female genitalia; Cabuntug, Siargao (September 10, 1916, preparation no. 4545, W.D.F.). FIG. 12.—*A.* (*S.*) *laomedia* (Druce): Ventral aspect of female genitalia; Butuan, Mindanao (June 6, 1915, preparation no. 4547, W.D.F.).

ZOOLOGY.—*New species of polychaetous worms from the Marianas and Gilbert Islands.*[1]

OLGA HARTMAN, Allan Hancock Foundation, University of Southern California. (Communicated by Fenner A. Chace, Jr.)

The types of the new species of polychaetous annelids described herein are in the collection of the United States National Museum. I am indebted to the administration of the United States National Museum for permission to examine these collections. The studies were made using the facilities of the Allan Hancock Foundation of the University of Southern California.

Family SIGALIONIDAE

Genus **Thalenessa** Baird

Thalenessa tropica, n. sp.

Fig. 1, *a–d*

Description.—There are parts of three specimens with none complete. The largest one from Onotoa, selected as holotype, measures 44 mm long for 78 segments; width with parapodia at its widest part in the anterior end is 3.7 mm. Preserved there is no color except a reddish-brown transverse bar across the posterior margin of the first, and anterior margin of the second elytra; a band of the same color crosses the dorsum of segments 14 and 15. There are minute spots of similar pigment across the anterior base of neuropodia but none on the elytra.

The prostomium is broadly oval, with its anterior end extended into three slender, linear, forwardly directed prolongations; they are fully fused to one another along their proximal margins; each extension has, at its distal end, a small, distally pointed oval antenna. The three are similar to one another in size and appearance (Fig. 1, *a*). The four large eyes are located on the prostomium behind the antennal bases. The two of a side are close together and the anterior ones are the larger. The paired palpi are very long and directed forward.

The first parapodium is long and slenderer than the others; it is directed forward so as to lie at the sides of the prostomium and extends far beyond it. It has a slender notopodium and neuropodium, each branch provided with filamentous dorsal and ventral cirrus. Setae are inconspicuous or absent but each ramus has a delicate embedded aciculum. The second parapodium is the first elytral one; it resembles those farther back but has more conspicuous marginal fringe along its distal extensions. It is directed obliquely forward. Its notopodial setae consist of a compact bundle of slender, spinous, distally pointed simple ones. Neuropodia have a more conspicuous fascicle of longer, multiarticulate setae and thicker shorter composite falcigerous ones.

The first elytra are inserted dorsally; they are small and circular in outline. Others are similar but more lateral in insertion; they are transversely elongate in outline. They leave the middorsum broadly exposed. Each elytrum has a marginal fringe at the outer lateral margin. Each fringe consists of a palmately branched filament (Fig. 1, *c*). The third parapodium is similar to the second one but has a dorsal cirrus (Fig. 1, *b*) instead of an elytrum. Notopodial setae are in a bundle and include 30 or more, as in the first parapodium. The setal fascicle is bounded along its outer margins by a series of about 5 digitate lobes and a dorsal bifid one (Fig. 1, *b*). The neuropodium is larger; it has a large, thin hyaline lobe at the anterior face which largely conceals the setae. A similar though smaller lobe encompasses the lower side of the neuropodium, and a single series of about five slender digitate lobes encircles the upper margins of the setal fascicle. Setae are entirely composite falcigers; there are about six long slender hooks in which the appendage is simple to multiarticulate, with four to nine incompletely separated articulations; there are as many thicker, bi-articled hooks in the same fascicle. The aciculum is single, heavy, translucent yellow.

In more median or typical parapodia there is an elytrophore with elytrum and a slender cirrus at the lateral outer base of the lozenge-shaped scar. Notopodia are reduced and have a close fascicle of many spinous fine setae and 2 slender fimbriae at the anterior margin of the fleshy lobe. Neuropodia are much larger, compressed, distally truncate. Each consists of a rounded, supraacicular lobe, a much larger foliose lobe in front of the setal series, a similar

[1] Contribution no. 132 of the Allan Hancock Foundation.

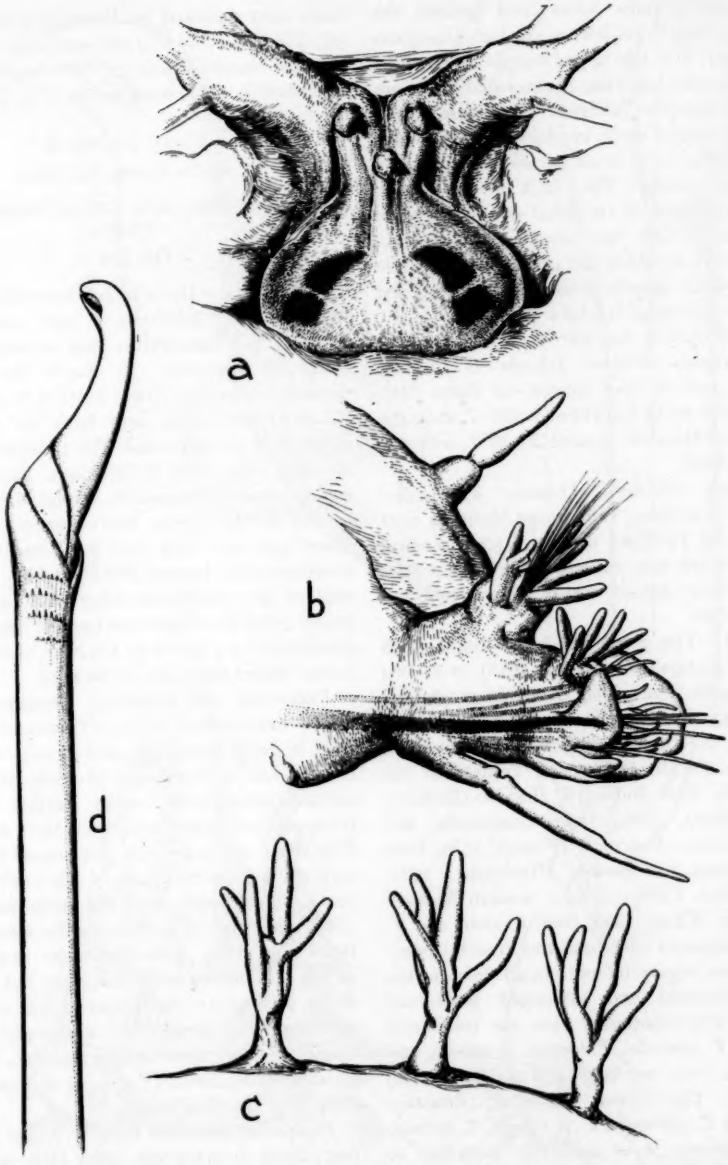

FIG. 1.—*Thalenessa tropica*, n. sp.: *a*, Prostomium showing the two pairs of eyes and antennae, in dorsal view, × 65; *b*, third parapodium showing arrangement of parapodial lobes, setae and cirri, in posterior view, × 62; *c*, elytral fringe from margin of a median elytrum, × 240; *d*, a neuropodial composite hook from a median parapodium, seen from the side, × 634.

though smaller lobe below and around the fascicle, a more conspicuous smaller, triangular lobe behind, and the upper margin is bounded by a few slender fimbriae. Neuropodial hooks are entirely composite falcigers. There are about five supraacicular hooks in which the appendage is simple (Fig. 1, *d*) or an occasional one shows two distal articles. The shaft is smooth or somewhat spinous at its distal outer edge. The subacicular bundle has about 11 somewhat thicker hooks in which the appendage is simple and the shaft usually smooth, or it may be somewhat spinous at its distal edge.

Type.—U.S.N.M. no. 26088.

Type locality.—Gilbert Islands at Onotoa, southeast end of area known as Rakai Ati, south side of a big windward point of reef near the center of the atoll, August 20, 1951, collected by P. E. Cloud.

Specimens examined.—Onotoa, 3¼ miles north, 31° west from Tabuararae Maneaba near the center of Te Rawa ni Boa, a pass in south part of leeward reef, collected August 23, 1951, by P. E. Cloud; lagoon west of Saipan, collected April 19, 1949.

Remarks.—The genus *Thalenessa* Baird, 1868 (including *Eusigalion* Augener, 1918), is known for few species from widely dispersed geographic areas. They include: *T. edwardsi* (Kinberg), 1855, from the La Plata region, South America; *T. gracilis* Fischli, 1903, from Ternate in the Netherlands East Indies; *T. lewisii* (Berkeley and Berkeley), 1939, from Guatemala and western Mexico; *T. oculata* (Peters), 1854, from Mozambique; *T. spinosa* (Hartman), 1939, from southern California and western Mexico; *T. stylolepis* Willey, 1905, from Ceylon; and *T. vazensis* (Augener) 1918 from the French Congo.

Thalenessa tropica differs from all these for the uniquely inserted and prolonged prostomial antennae. The prostomial eyes are small and spotlike in *T. edwardsi*, *T. lewisii*, *T. spinosa* and *T. vazensis;* they are large and conspicuous in *T. tropica*. The elytral fringe is pennately branched in *T. edwardsi*, *T. stylolepis*, *T. spinosa* and *T. vazensis;* it is palmately branched in *T. lewisii*, *T. oculata* and *T. tropica;* it is simple and filiform in *T. gracilis*. The insertion of the median antenna is behind the anterior eyes in all but *T. lewisii*, *T. tropica* and possibly *T. gracilis*.

The nearly related genus, *Euthalenessa* Darboux, 1899, is perhaps the same; its species have been reviewed by Wesenberg-Lund (1949, pp. 258–260). None of the species in the genus has the modifications of the prostomium as described for *Thalenessa tropica* (Fig. 1, *a*).

Family SPIONIDAE

Genus **Nerine** Johnston

Nerine cirratulus (delle Chiaje) **saipanensis**, n. subsp.

Fig. 2, *a–e*

Description.—There is one complete (largest) individual that measures 31 mm long, 2.3 mm wide at greatest width, and consists of 122 setigerous segments. In shape the body is depressed linear; it tapers forward to an acutely pointed prostomium and back to a slightly constricted posterior end. The prostomium is an elevated ridge that is prolonged forward as a slender conical process; it extends back to the middle or end of the first setigerous segment. There are four dark eyes in a nearly straight transverse row, located just behind the thickened part of the prostomial ridge (Fig. 1, *a*). The paired palpi have been lost but the scars of their attachment are visible at the sides of the prostomium behind the region of the eyes.

Parapodia are biramous throughout. The first is the smallest; it has a foliaceous postsetal lobe in both notopodia and neuropodia; each branch has a fan-shaped fascicle of slender, inconspicuous pointed setae. Farther back the parapodia are much larger and have branchiae. The latter are large from the second setigerous segment and directed upward. They are fused for part of their length with the upper edge of the notopodial lobe, as typical for the stem species. Branchiae attain their maximum development in the anterior third of the body but continue to be present to the posterior end as slender processes that exceed the notopodial lobe in length. A linear series of fine fimbriae, best seen on anterior segments (Fig. 1, *b*) is present along their inner marginal length.

Parapodial lobes are broadly foliose from the first; those in notopodia differ little in anterior and posterior regions except that there is decrease in size going back. The neuropodial postsetal lobe is at first rounded (Fig. 2, *b*); in median and posterior segments it comes to be prolonged vertically so that the setal fascicle is along only a small lower portion of its length (Fig. 2, *c*).

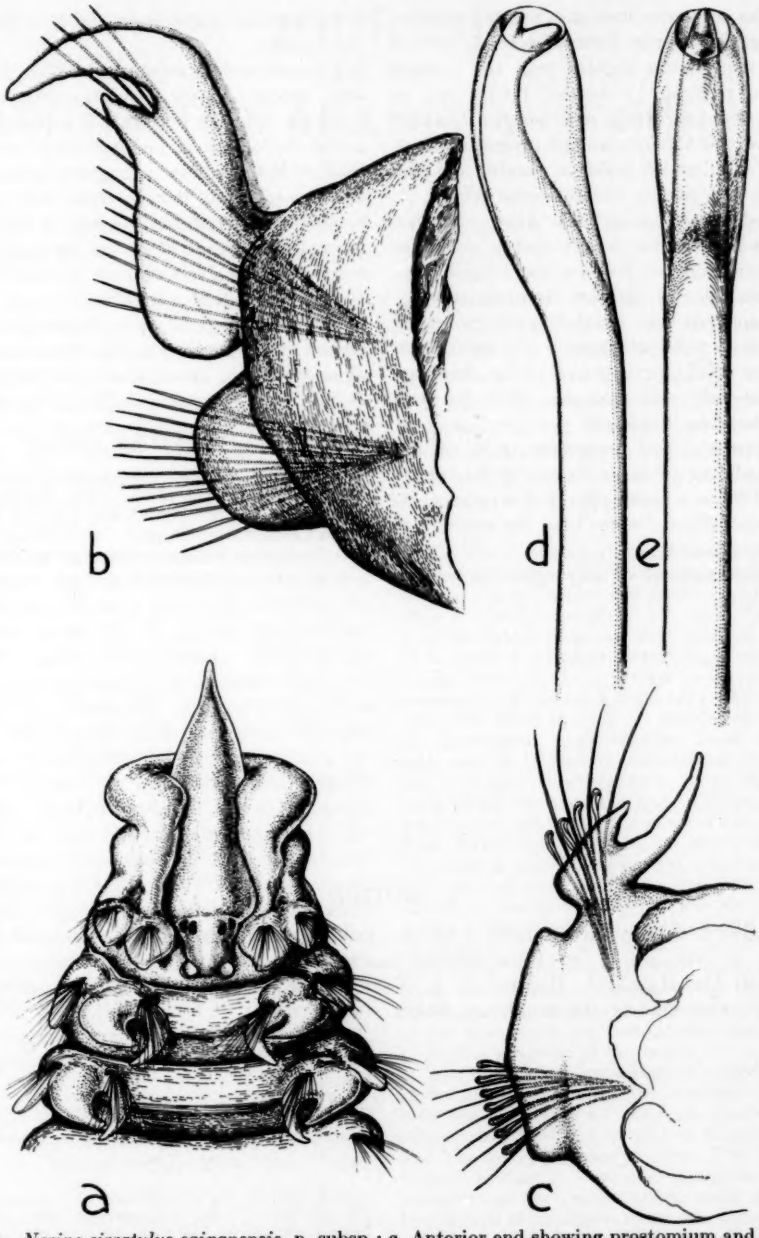

FIG. 2.—*Nerine cirratulus saipanensis*, n. subsp.: *a*, Anterior end showing prostomium and its parts and the first three setigerous segments, in dorsal view, × 49; *b*, tenth parapodium showing relations of parapodial lobes, branchia and setae, in posterior view, × 78; *c*, a far posterior parapodium showing relations of parapodial lobes, branchia and hooks, in posterior view, × 49; *d*, a neuropodial hooded hook seen from the side, × 790; *e*, a neuropodial hooded hook seen from the front, × 790.

Anterior segments have only pointed setae in spreading, single series. From segment 31 (in the holotype) or 29 (in another one) the pointed setae are replaced by hooded hooks, few in number and alternating with slender, pointed setae. Notopodial hooks are first present at about segment 41; they are fewer in number and also alternate with slender, pointed setae (Fig. 2, *c*).

Pointed setae are of two kinds; anterior segments have thicker, longer ones in which the superiormost one or few are the longest. The companion setae in posterior segments are very slender and hairlike. Hooded hooks or uncini (Fig. 2, *d*, *e*) terminate distally in a bifid tip in which the main fang is obtuse to the shaft and the distalmost tooth is in line with the main tooth (seen from the front).

The posterior end terminates in a slightly constricted ring which is longest at its ventral edge and forms a flaring lobe that is entire at its margin and slightly wider than the second last setigerous segment.

The middorsum of all body segments, between the notopodial ridges, is crossed by a transverse ciliary ridge.

The subspecies, *saipanensis* differs from the stem species, *Nerine cirratulus* (Fauvel, 1927, p. 36, fig. 11) from western and southern Europe in that the four prostomial eyes are in a transverse line, not in trapezoidal arrangement; the pygidial lobe has a margin that is entire, not festooned; hooded hooks are first present in neuropodia from about segment 29–31, not from about 40; in notopodia from about segment 41, not 60 to 68.

Type.—U.S.N.M. no. 26090.

Type locality.—Matuis Beach, northwest Saipan; dug from sand in about 6 inches of water along the beach, December 19, 1948, collected by P. E. Cloud, Schmidt, and Flatt (7 specimens).

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NOTICE

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